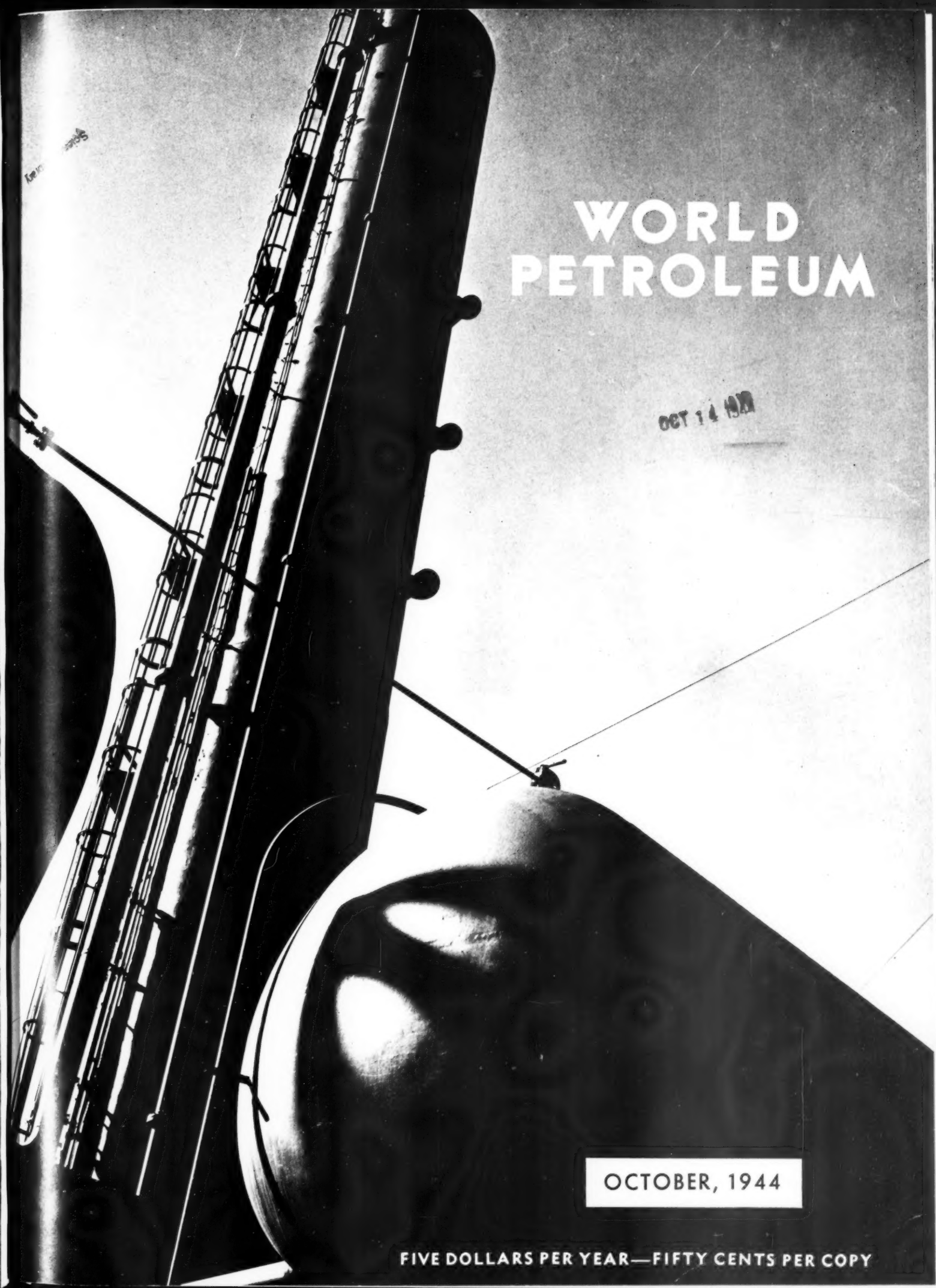

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Gasoline Moving via Higgins Boat to Transport Heading for Bougainville. Signal Corps Photo.

EDITORIAL

NEW PROBLEMS RISE BEFORE THE OIL INDUSTRY

MANY words of encomium, many marks of honor officially bestowed, many tributes to seemingly miraculous achievements in origination, adaptation and construction have been directed to the oil industry of the United States for its work in fueling the war. Well deserved credit has been given to it for raising production to a volume by many deemed unattainable, for its major part in replacing the seemingly irremediable loss of the nation's rubber supply, for providing overwhelming quantities of the most powerful aviation fuel ever produced and for many other feats that are catalogued as industrial miracles. Its share in bringing to the arms of the United Nations decisive victories by land, sea and air has been duly accorded. In short, it is acknowledged that the industry has met every test of war and has demonstrated beyond question the vital nature of its contribution to the final triumph that lies close ahead.

The tasks of these war years, stupendous as they have been, were tasks with which the oil men of the country, by nature and by experience, were well fitted to cope. They called for ingenuity, swift improvisation, ready adoption of new methods and ideas and a determination to regard no obstacle as insurmountable. These are the qualities developed by the spirit of free enterprise which have been responsible for American progress during more than a century and a half of national life. In no other field have they been better evidenced than in the finding and production of oil.

With the end of the war now measurably within sight the oil industry finds itself facing a series of problems quite different from those that have absorbed its attention during the three years past. These are economic, political and juridical questions which are in some respects more difficult for the average oil man to deal with than are those relating to the overcoming of physical obstacles or the risks of exploration. After being urged for three years to expand production to the ultimate limit he sees himself confronted with the probability of a sharp drop in demand that may adversely affect the price of his product during the period that must intervene before industry as a whole can readjust itself to full peacetime operation. After being abjured to pool his facilities with those of former competitors he learns that the Department of Justice is planning a legal attack against an industry association that is devoted to the encouragement of technical progress, safety measures and the establishment of uniform standards for equipment. After freely surrendering to the federal government the regulatory authority formerly exercised by local and state bodies he fears that it will require a struggle to bring about its return to these agencies. He sees the national government embarking upon a plan for international control of oil that many circumscribe export trade and adversely affect domestic interests.

These are matters to which the individual member of the oil industry should give early and serious consideration. They are in fact forcing themselves upon his attention regardless of his wishes. On some of the topics mentioned opinion within the industry is fairly well defined. Sentiment strongly favors, for example, state as against federal regulation on the ground that state authorities possess a more intimate knowledge of the characteristics and requirements of fields within their jurisdiction than can possibly be had by a centralized national bureau, no matter how ably administered. And while oil men have been assured many times that the various war agencies will be liquidated as soon as the war ends, they believe that influential men want to see federal control perpetuated or at least maintained as long as possible.

Opinions on the project for an inter-governmental cartel to influence production and to regulate the flow of oil in international trade is not so fully crystallized. This is largely due to the fact that the preliminary design for such a far reaching convention, as embodied in the British-American agreement, is expressed in such vague and general terms that its exact meaning and scope remain undefined. Now that the agreement as written has been submitted to the Senate for approval the oil industry is promised an opportunity of which it should take advantage to obtain a better understanding of what the document really portends and to proffer its own suggestions as to the operational form in which it should be established if approval is extended.

The coming year is likely to call for decisions that may greatly influence the course of the oil industry at home and abroad not only for the immediate future but for many years to come. The oil industry has earned the right to a voice in the making of these decisions. It should exercise the right by full discussion of plans and policies presented and by a definite expression of its own views and desires.

Lieut.Gen. Somervell

Vice Admiral Horne

Rear Admiral Smith

Brig. Gen. Powers

LOGISTICS OF PETROLEUM SUPPLY TO THE WAR FORCES

By William J. Maddox

Movement of Millions of Barrels of Oil Products from Well and Refinery to Battle Fronts Under Supervision of Army and Navy Petroleum Board and Through Efficient Work of Quartermaster Gasoline Supply Battalions Keeps Fighting Men Provided Around the World.

In a war of machines, waged by land, in the air and on the sea, and extending entirely around the globe, a factor of vital importance is the supply of petroleum products to every theatre of action. Equally important is the movement of these supplies, thousands of tons every month, to the places and in the quantities needed. In the accompanying article is told, for the first time, how this stupendous task is directed by a little known group of men in Washington and carried out by a special branch of the service whose members not only handle these essential supplies but fight to establish operating bases whenever necessary.

One of the big stories of this war — when the "wraps" come off and it can be fully told — is how the military, in spite of seemingly insuperable odds, has kept petroleum flowing on time and in sufficient quantities to the farthest spearheads of our combat forces. That's the military's own part in making good the boast that the fighting forces have never lacked for oil. The industry performs miracles in turning out the vast streams of products; the military directs these from the refineries to the battle fronts.

Atop the over-all situation in Washington is the four-man Army-Navy Petroleum Board, shunning the limelight but writing one of the great chapters in logistics. The Board is one of the smoothest functioning units in the war effort and operates with an informality that would baffle the bureaucratic mind. Red tape is unknown. In fact, the Board's theme is: Get the oil to where it's needed and when, and damn red tape. And the four officers who constitute the Board are empowered by the Joint Chiefs of Staffs to do just that.

Top-ranking member of the Board is Lieutenant General Brehon B. Somervell, U. S. A., Commanding General of the Army Service Forces. Next in line, his junior by one day, is Vice Admiral F. J. Horne, U. S. N., Vice Chief of Naval Operations; Rear Admiral William W. Smith, U. S. N., Director, Naval Transportation, and Brigadier General E. M. Powers, Army Air Force, are the other members of the Board.

The Board was originally set up in July 1942 by General Somervell and Admiral Horne to meet an urgent need for coordinating the petroleum supply activities of the services — Army, Navy and Army Air Force. Up to that time each service was largely on its own in obtaining and handling its requirements of petroleum products, and in dealing with other government agencies such as the Petroleum Administration for War.

All too often one service would compete with another in procuring some critical product. And in some instances one would take all the available supply of a product in one locality, compelling the others to procure theirs from some other source that added problems of timing and transportation. As military operations stepped up in the first part of 1942, the problem mounted. Coordination of all services through the Army-Navy Petroleum Board proved the answer. Since January 1943 the Board has been an agency of the Joint Chiefs of Staff, and as now set up it is doing a tremendous job with top efficiency.

The Board is not an operating unit. Its work is more in the field of over-all planning, and on a world-wide scale. It sees to it that the total requirements of all the services for all the war theatres are available when needed. It divides up the various products among the services, and it sees that the required products get to each theatre of operation on time and in sufficient quantity.

Until early in 1943, transportation here in this country as well as off-shore was the chief concern of the Board. The sharp rise in military requirements then, however, brought the question of supply to the front. A planning Division became necessary. Among other things, this division has to know in a global way the location and availability of all petroleum products; the crude oil situation and refining capacities and products in the various producing areas that can be drawn on; and where and what tankers are obtainable.

With such a picture before it, the Board can

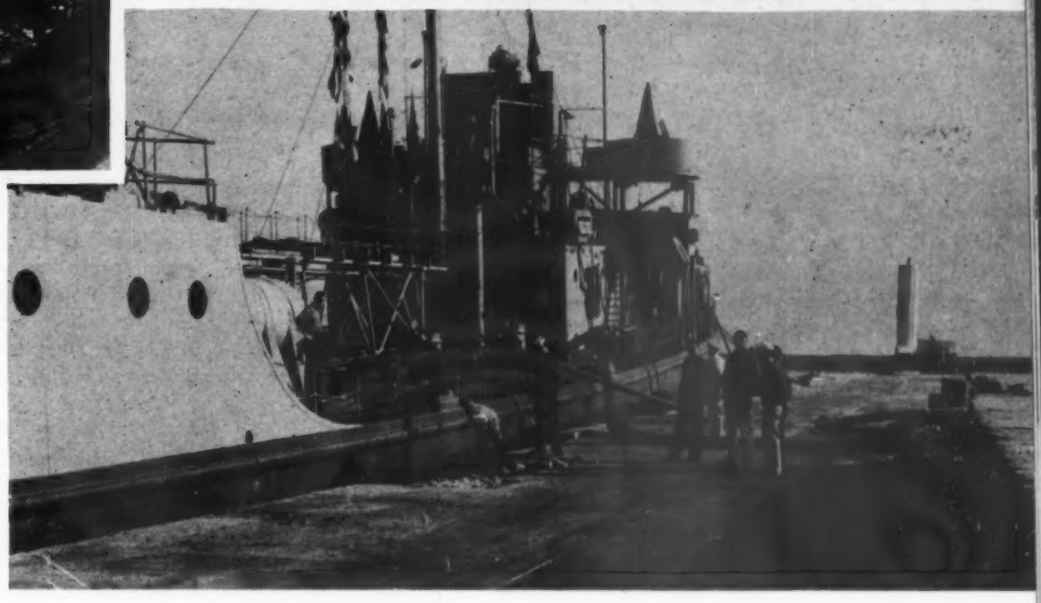
Brig. Gen. Pyron

Rear Admiral Carter

Brig. Gen. Peckham

Col. Howze

Unloading Aviation Fuel, New Guinea.



Top: Loaded Tank Cars En Route to an Army Supply Base.

Above: Tanker Discharging Cargo at an Italian Port.

determine where the products for a particular theatre should come from — maybe from the United States, maybe from South America or some other foreign producing area to which we have access. Time, available supply, efficient use of tankers are some of the factors that enter into the decision. Having arranged for the tankers and the convoy, provided there are no diversions enroute or mishaps, the Board's responsibility ends when the consignment is laid down at the beach-head. From the beach-head on, the problems of handling the oil — transporting it to other points in the theatre of operations, packaging, and such —are up to the appropriate services in that particular area.

Primarily the Board is concerned with the movement of petroleum products in bulk. In the early stages of the war, an enormous amount of products was shipped in 5-gallon and 50-gallon containers. While the volume of packaged products has fallen off considerably, it is necessary for the Board to have at its finger tips complete requisitions of all petroleum products whether in bulk or for package shipments.

The Board can hardly be said to have any routine affairs. Every deal has its own peculiar problems that have to be solved. Much of the actual operating detail, however, is handled by an Executive Committee of the Planning Division. On questions requiring decision or action by the Board this committee makes recommendation. It is composed of Brigadier General W. B. Pyron, Chairman; Rear Admiral A. F. Carter, Executive Officer of the Board; Brigadier General H. L. Peckham, Director of Fuels and Lubricants Division, Office of the Quartermaster General; and Colonel H. W. Howze, Chief, Aviation Petroleum Branch, Army Air Force.

For its direct contact on all matters concerning petroleum in each of the theatres, the Board looks to the Area Petroleum Officer. This officer is not an agent of the Board, however, but is usually a member of the staff of the theatre commander designated by him to handle petroleum matters in addition to his other duties.

The Area Petroleum Officer is responsible for learning from each service in his theatre its requirements for short term delivery and for furnishing an estimate of needs for several months ahead. He details quantity and quality of products, packaged as well as bulk. He then screens these requirement figures, taking into consideration the known or possible military operations, and the need for building up reserves at various points. The result is transmitted to the Army-Navy Petroleum Board in Washington as a requisition.

Here the requisition is screened along with others from other war theatres and figures on the total requirements worked up for the guidance of the Petroleum Administration for War in arranging for production of sufficient quantities of the various products.

On an average in this country it takes about 90 days for a barrel of crude to be piped from the field, processed in the refinery and made available as products at a coast port for shipment. The journey overseas may take anywhere from 30 to as much as 60 days, depending on the theatre the product is going to. Requirements, estimates and all necessary plans, therefore, must be made far ahead of actual need for the product.

One important accomplishment of the Board has been the coordination, simplification and standardization of specifications for products and containers. The Board does not initiate or write the specifications, as this is the job of the technical services of the Army and the Navy. However, to cut down as much as possible the number of grades and kinds, the Board, wherever possible, has got the two services to agree on common types. In some instances it has gone

Gasoline Drums Going Ashore from Tank Lighters in South Pacific.

Left: Moving Gasoline from a LCM to PT Base in New Guinea.

Laying a Portable Pipe Line During Invasion of Italy.

even further and obtained the agreement of the British and other allies.

Through this sort of give-and-take cooperation between the services, the Board has been able to reduce the number of specifications for major petroleum products to an absolute minimum. Differences in equipment, however, have hindered agreement on simplifying specifications for all the specialty oils and greases. But progress is being made. The over-all problem of supplying these is not a serious one, as the percentage of specialty petroleum products is very small.

At the beginning of the war, practically every oil company had its own method of painting and marking containers. The armed services both here and abroad had various types of markings. This diversity caused great confusion in the various theatres. As a result of the work of the Board's specification section uniform painting and marking has been adopted by the Allied nations.

Once the gasoline has been unloaded from the tanks or transport at a base storage point in the war theatre, ANPB washes its hands of further responsibility and the Quartermaster Corps takes over insofar as supply to ground-using Army troops is concerned. From here on Quartermaster troops have the task of getting the fuel to the various operating forces. If laying a pipe line or storing the gasoline in large bulk storage tanks is involved, that is done by the Engineers, who have units specially trained for the purpose.

Roughly, the flow of bulk gasoline from the United States and other refinery sources is by tanker to the theatre, pipe line from ship's side to base bulk storage, pipeline to foward outlets, tank truck to truck-heads and filling points, where it is put into five gallon cans and trucked to the units at the front.

It's a well publicized fact that nearly two-thirds of the volume of supplies going to combat areas overseas is petroleum products. Well over half of the supplies handled behind the lines is petroleum products. But here are a few figures to show the tremendous consumption of gasoline by forces in action. A normal armored division in combat uses about 80,000 gallons a day. It requires about 200 gallons to move an infantry division one mile. An Army consumes somewhat more than 5,000,000 gallons, about 16,000 tons, a month.

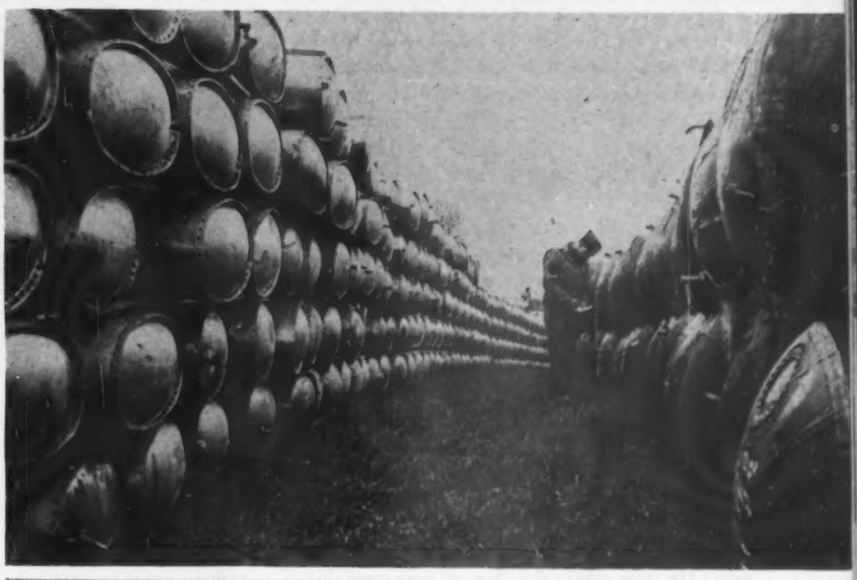
Many months before the operation is actually started the volume of petroleum products necessary to carry it through without a hitch is arranged for, along with the manpower and equipment that will be required to keep the flow of gasoline and lubricants moving to the front. Naturally no one hard and fast procedure for distributing the supplies can be laid down as conditions in each combat area vary widely, and it is up to the officers in charge in the particular area to adjust their operations to fit the circumstances.

Ordinarily bulk products are taken from bulk tanks as far as possible by pipeline or tank car. Sometimes trucks and tank trucks are used. If it is a beachhead operation, specially trained gasoline supply units of the Quartermaster Corps, attached to an Infantry Division, go ashore right along with the combat troops and land the first supplies of gasoline and oil—enough to keep vehicles supplied for a few hours at least —in 5-gallon "blitz" cans.

These troops bring the petroleum up on the beach, stack the cans in orderly fashion, using natural cover and camouflage when possible and as rapidly as possible establish themselves so as to be able to load the cans in the Quartermaster trucks that will carry them up to the front lines. The importance of stacking the cans orderly, for ease in handling under blackout conditions, has been stressed in reports received of operations.

As soon as the beachhead is established, another Quartermaster unit moves in and takes over the petroleum supply job as the men of the first unit move on ahead to stay with their infantry division. This new unit is the Quartermaster Base Petroleum Supply Company, one or more of which is organically a part of each Army. Its duty is to operate the distribution service for gasoline, oil and lubricants, which by this time are being landed in 55-gallon drums or distributed from bulk storage at the beachhead — if this has not been destroyed by the enemy or our own pre-invasion shelling — or by pipeline from tankers that have been brought up offshore.

Troops from this company fill the 5-gallon cans that have been shuttled back from the front.



Top Left: Huge Supplies Were Stored in Britain in Preparation for D-day.

Bottom Left: Navy Transports Drink Deep for Atlantic Flight.

Top Right Bulk Storage Depot in North Africa.

Center Right: Self-Sealing Fuel Cells for Fortress Attacks on Germany.

Above: Airfield in Assam During the Monsoon.

and load them in trucks for another trip up to the tanks and other equipment using the products. The company is made up of three platoons, each of which can operate separately if expedient, and the entire company can distribute 100,000 gallons of petroleum products in eight hours—more than a quarter million gallons in a 24-hour day.

These are the gasoline supplying troops who operate during the first few days and weeks of the actual storming of the beachhead and the start of the invasion. After the troops have pushed inland, base depot organizations with their operating units move in, each with a separate fuels and lubricants section, to pass petroleum products up to the earlier units who by this time have moved on ahead. Once the depots are set up, bulk storage is established on the invasion coast, replacing more distant main storage points.

The training of these various organizations for supplying gasoline and oil to the war machines begins back here in the States, at the Quartermaster Replacement Training Center at Camp Lee, Va., and at the Quartermaster Unit Training Center, Fort Warren, Wyo. The men receive basic military training first of all, for they are the "fighting Quartermasters"—soldiers first, supply men second. During this training they learn to handle weapons, dig foxholes, and receive all the other military preparation to enable them to fight, if necessary, for the ground on which their establishment is to be set up, and then defend it.

When the gasoline supply company arrives at the rail or truck head, it immediately makes preparation for reducing the bulk supplies into 5-gallon "blitz" cans. This is the "dump" or canning station and most of the canning is done at these field stations. The best possible use is made of all available cover. The terrain for a suitable field dump should be level and

well drained, and accessible from the main supply road. The operation must be hidden from the enemy, and camouflage is highly important.

For reducing bulk fuels into the "blitz" cans each platoon of the company is equipped with two gasoline-powered dispensing units — one mounted on a one-ton, two-wheel trailer and the other a much smaller affair that can be carried in the weapon carrier or in any of the supply trucks. The first has a capacity of 6000 gallons of gasoline an hour, the other about 1800 gallons. Each platoon, too, is equipped with 13,000 "blitz" cans. Quartermaster Truck companies provide cargo trucks to transport this number of filled cans from point to point as the location of the railheads, truckheads and distributing points change.

The advance dumps are kept small, maybe not more than 5000 gallons of gasoline at any one at a time; and the stacks of cans are dispersed as widely as possible for efficient handling. Empty containers as they are brought back from the fighting fronts are arranged in double lines for convenient filling and handling and in relatively small groups so that fire or enemy action will not destroy the entire supply. Fire trenches are dug around each group of cans.

In the filling process one man operates the trigger on each nozzle of the hose from the dispensing unit. He goes down the line of cans preceded by a helper who removes the caps from the cans and inspects containers to be sure they are clean and ready for service. Another man follows the can filler and replaces the caps, screwing them down tight. The nozzles are equipped with whistles to warn the operator when the can is full, a precautionary measure that is especially valuable under blackout conditions or during sand, rain, or dust storms when it is desirable to plug the opening of the can completely while filling.

From the dump the filled cans are moved forward to the advanced distributing points in 2½ ton cargo trucks and 1-ton trailers. The cargo trucks will normally carry 125 cans and the trailers 40. At the distributing points they are exchanged for empties which are returned to the dump for refilling.

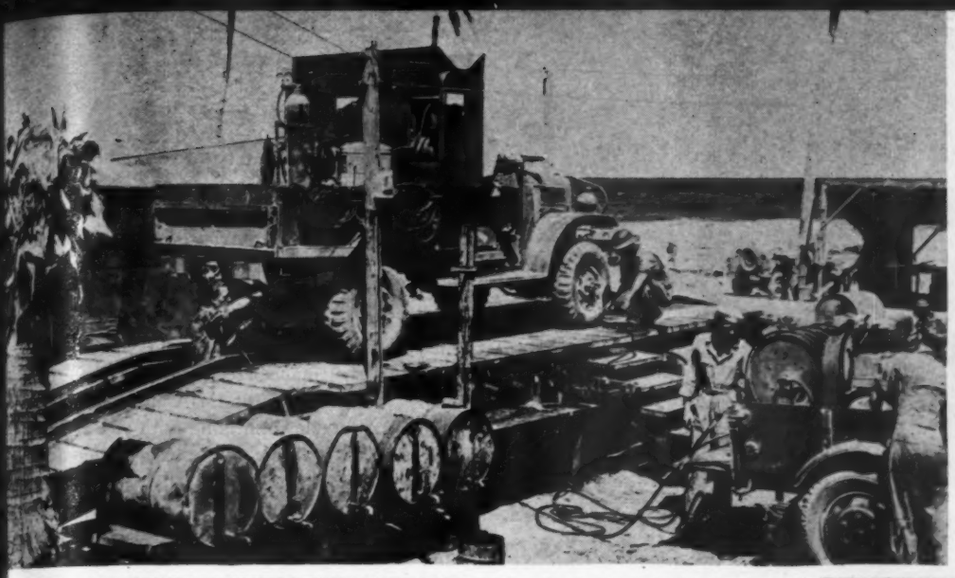
Ditching around the stacks of filled cans at forward distribution points usually is not done to safeguard against fire. The danger is not so much in flowing burning gasoline as it is in the possibility of the container exploding and falling into near-by stacks. Moves may be too frequent to warrant the time and manpower spent in such digging. Sometimes, to counteract the effects of a chance explosion, in areas where artillery fire or bombing exists, bulldozers are used to throw up earth around the stacks. The earth cushions

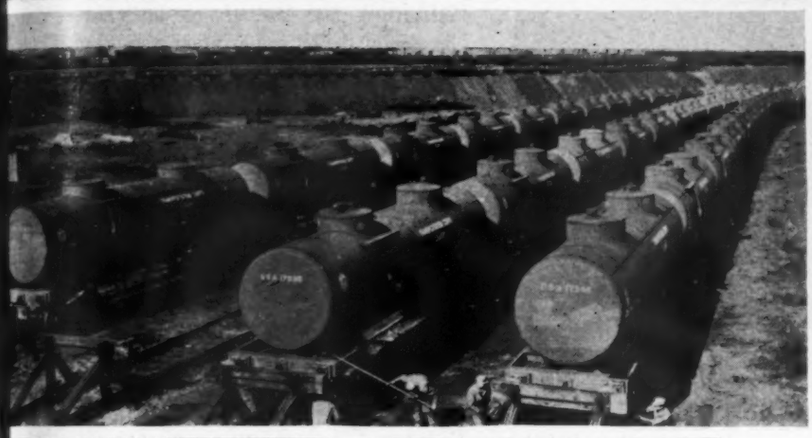
Above: Preparing Oil Drums to be Dropped by Parachute.

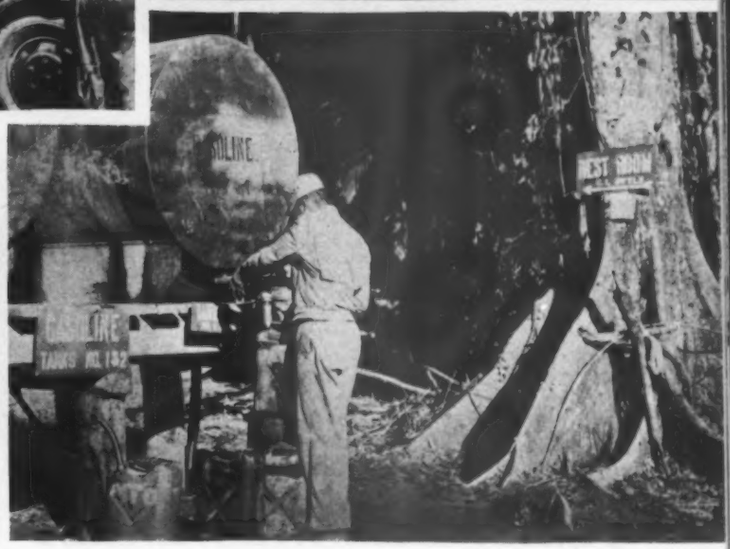
Right: Transferring Drums to Dumps in Iceland.

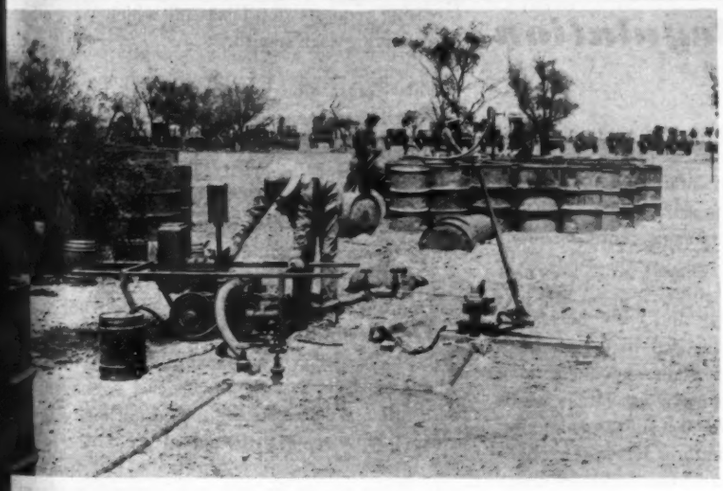
Far From Home a Tank Truck Fills "Blitz" Cans in South Pacific.

Below: Biederman Fueling Air Field.









Top Left: Navy Seabees Improvise Grease Rack on Eniwetok.

Top Right: A Temporary Loading Rack in Italy.

Middle Left: U. S. Army Tank Cars at a British Supply Depot Before D-day.

Lower Right: Filling Cans at a Gasoline Dump in Burma.

Left: Portable Pumps at an Australian Filling Station.

U. S. Signal Corps Photo.

the explosion and throws it upward rather than outward.

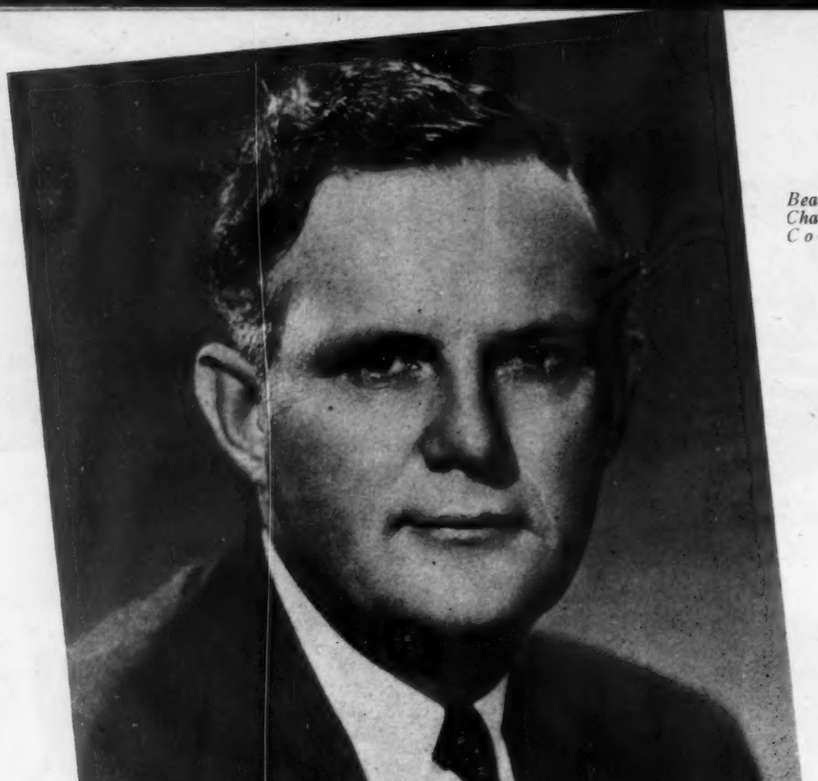
In laying out a dump site, about two square yards of area is allowed for each gallon of gasoline. Seventy-five yards is considered generally the minimum distance between stacks of filled cans. The stacks are usually two cans high, twenty-five long and twenty wide, or a total of 5000 gallons to the stack. With the 55-gallon drums, it has been found that they should be stored on the ground on their sides. These are also stored two high, in stacks 100 drums long. A drum length is left between two adjacent rows of drums, and the seventy-five yard minimum spacing is maintained between alternate double rows.

Facilities for a free flow of traffic to and from the dump are of prime consideration. There must be no traffic snarls, as a smooth speedy movement of gasoline to the distribution points at the front is imperative. First duty of the officer setting up a dump is to notify all units drawing supplies from his station just where it is located. So, in addition to entrance and exit markers at the dump itself, he posts large and easily read identification signs at road junctions, intersections and other spots where there is the slightest possibility of drivers becoming confused.

Sometimes there arises the necessity of supplying fuel to mechanized units in isolated places or that have penetrated behind the enemy's line and cannot be reached by trucks. The only means of contact with them is by air, and cargo planes are called into service. By parachutes 55-gallon drums of fuel may be dropped to a distribution point established near them. A dispensing unit, can be dropped for putting the gasoline in the customary "blitz" cans. And, if necessary, a man can be parachuted to the spot to put it into operation.

Also, there may be a detail in an isolated place that does not use vehicles, but it does have to eat and be kept warm, and the country may be such that gasoline is the only fuel that will enable the men to do this. As an instance of its careful planning, the Quartermaster Corps is ready to drop small amounts of urgently needed fuel to them from the air.

Fuel and lubricants are such a vital part of field operations that the handlers of these supplies must be prepared to meet unusual conditions wherever they arise. In the sweep of American troops across France armored divisions outran the supply forces and it became necessary to use transport planes to fly gasoline and other supplies to the advance points near the German frontier. Big C-47 transports were pressed into use and moved many tons of petroleum products to the front pending the set up of the regular system of supply.



Beauford H. Jester, Chairman, Railroad Commission of Texas.

TEXAS DEMANDS EARLY RETURN
To State Oil Regulation

By Frank B. Taylor

As the prospect of an early termination of the war in Europe becomes increasingly favorable attention turns more and more to consideration of conditions that will prevail after the end of hostilities. In the oil trade concern for the future extends not only to members of the industry who have responded unhesitatingly to military demands which have pushed up production to heights that would have seemed fantastic only a few years ago but it also gives ground for serious thought to state regulatory authorities of conservation, the fruits of which they long and earnestly to bring into operation practices of conservation the fruits of which they now see endangered by the high rates of withdrawal put into effect to satisfy military needs.

These officials, who are charged with the protection of the oil resources of their individual states and who possess accumulated data and a personal knowledge of local conditions and of safe operating conditions that no outside agency can hope to equal, naturally are anxious to reinstate as soon as possible the supervision which was readily relinquished to the federal government at the beginning of the national emergency.

This feeling, not unmixed with a fear that federal control might be prolonged unnecessarily, has been particularly strong in Texas which as the No. 1 oil producing state of the country has borne the main burden of meeting the war demand for petrolelm and is producing at the present nearly 45 percent of the whole national output. Under the quota currently assigned to the state, Texas is producing more oil daily than ever has been brought to the surface by any country except the United States. With its great stake in the industry and with the leadership that it has long exercised in oil affairs it was logical for Texas to raise the question of "reconversion" in oil industry regulation which it did in a letter addressed to Petroleum Administrator Ickes by Beauford H. Jester, chairman of the Texas Railroad Commission in which he said in part:

"As Chairman of the Railroad Commission of Texas, I wish to respectfully bring to your attention (1) the desire and intention of this Commission immediately upon the termination of the war to resume the entire regulation and conservation of oil and gas in Texas under the laws and statutory authority given it by the State of Texas, and (2) our willingness to cooperate with you as Administrator of the Petroleum Administration for War to liquidate the Petroleum Administration for War and assist in the relinquishment of its administrative regulation and control of oil and gas and the oil and gas industries in Texas and the other oil-producing states after the war. . . . .

"If the plans for the termination of the Petroleum Administration for War and its regulatory control have been made, the Railroad Commission of Texas would greatly appreciate being advised of these plans. If plans for liquidation of the Petroleum Administration for War at the end of the war have not been formulated, this Commission tenders its assistance to your office in and for the immediate formulation of these plans. The members of this Commission would be most agreeable to meeting with you and your staff for this purpose if our cooperation is desired.

"Conservation of oil and gas is properly a function and duty of the states. Texas has long recognized this. You are no doubt aware that because of the oil conservation statutes of Texas and their enforcement by this Commission by conservation orders and rules, Texas oil was available and has been the most potent factor in the oil production which the United States had to have to meet military and civilian needs during the war.

"The heavy war demand upon the oil fields of Texas has not only reduced and depleted the oil in these reservoirs and reservoir pressures, but in many fields has necessitated their being produced above their maximum efficient rate of production. This was willingly and promptly done, however, in order to meet the heavy increasing requests for Texas oil which your office is certifying each month.

"This Commission is studying plans to meet the changed conditions in the oil and gas industry after the war, when the military needs for oil will be sharply reduced. Texas and other oil-producing states will have many conservation problems to meet. We want to be ready immediately to start work on conservation and adding to our depleted reserves by exercising our regulatory rights to that end. We do not want our administration and handling of these problems to be delayed or impaired by any question about or dispute with any federal agency as to our full and complete right and authority to do these things free of federal control. .

"If there are to be any requirements made of the State of Texas or the other oil-producing states by the Petroleum Administration for War, or any other federal agency before it relinquishes and returns full regulation and control of the oil and gas to the states, these requirements should be made known immediately in order that they may be studied, appraised, and satisfied before or by the end of the war."

To this communication the Petroleum Administrator replied on September 4 as follows:

"In your letter to me of August 15 you request that the Petroleum Administration announce a 'plan and processes' for its 'liquidation' and for 'returning the regulation of oil and gas to the oil-producing states.'

"I repeat and reiterate what I have said many times. The Petroleum Administration for War is a war agency. Its regulations and restrictions are being relaxed and will continue to be relaxed and revoked as rapidly as war conditions permit. The only regulations of the Petroleum Administration which even indirectly affect matters over which your commission has jurisdiction are those which regulate the use of materials for the drilling of oil and gas wells on tracts of prescribed areas. With the relaxation and revocation of these regulations, all of the states and their regulatory authorities are automatically left free to control these drilling operations in such a manner as they determine to be necessary. I am at a loss to understand how it would be possible to present any more definite 'plan and processes' for 'returning the regulation of oil and gas to the oil-producing states.'

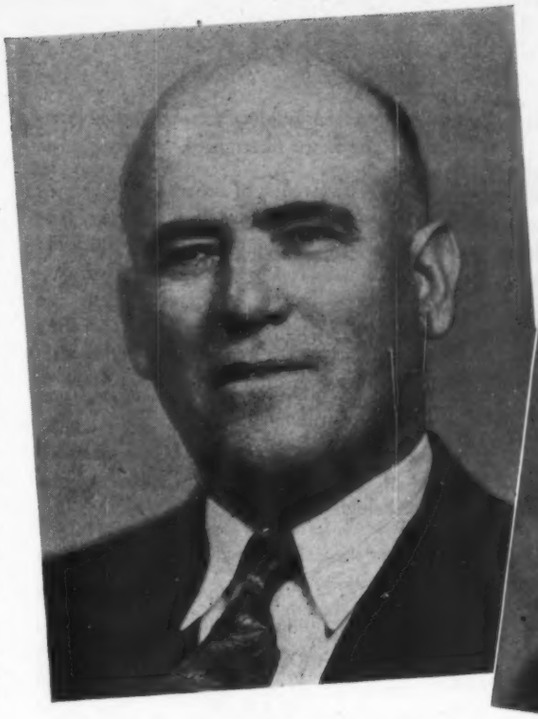
"You state that you have certain proposals to make which will be of aid to the oil industry and to all state regulatory bodies. Since these proposals affect all the oil-producing states, may I suggest that they be submitted to the National Conference of Petroleum Regulatory Authorities. This body is composed of representatives of all state regulatory agencies and was created by the Petroleum Administration for the purpose of considering and making recommendations to this agency with respect to proposals of the character you seem to have in mind. I shall be glad, of course, to consider with that conference any proposals which you or the members of your commission desire to submit."

In commenting upon this rejoinder Chairman Jester elaborated his views in the following statement to World Petroleum:

"Mr. Ickes states that since PAW is a war agency that upon relaxation and revocation of its regulations all of the states and their regulatory authorities will be automatically left free to control their drilling operations. This is well and good provided (1) there is an early termination and announcement of when the relaxation and revocation of its regulations will be made, and (2) there will be no effort on the part of the federal government to continue federal regulation and control of oil and gas through some other federal agency.

"Mr. Ickes is in error in stating that, 'the only regulations of the petroleum administration which even indirectly effect matters over which your commission has jurisdiction are those which regulate the use of materials for the drilling of oil and gas wells on tracts of prescribed areas'.

"It is well known that PAW each month certifies the amount of crude oil that each oil producing state should produce the following month for the war effort. There are other regulations also. For instance, PAW will furnish material for the drilling of an oil well, but if it turns out to be a gas or distillate well, they will not allow it to be immediately produced but will require a 15-day delay in the completion and production of the well until PAW agents have imposed production requirements that will have to be met by the operators. This means that the operators must for 15 days pay approximately $400.00 to the crew while waiting on PAW to decide what production requirements will be made. Other instances of arbitrary control could be cited.



Olin Culberson, Commissioner, Railroad Commission of Texas.

Col. Ernest O. Thompson, Railroad Commissioner of Texas.

"We should like to have assurance that after the war these certifications will no longer be sent to us and that this Railroad Commission can determine at its statewide hearings, from the nominations or requests for crude oil, the amount of oil that should be produced in Texas the following month.

"Mr. Ickes indicates in his letter that he prefers not to deal with the Railroad Commission of Texas in considering proposals originating from the oil operators as to the relinquishment of certain regulations of PAW which are burdensome to industry and which would not impede the war effort and the coordination job being done by PAW. He prefers that these proposals be first submitted to the National Conference of Petroleum Regulatory Authorities and that this body make its proposals and regulations to PAW and Mr. Ickes. This is disappointing for the reason that it would require a meeting of NCPRA to consider and approve these proposals and to present the same to PAW. This promotes delay."

In spite of published assurances that the Petroleum Administration for War will be promptly dissolved as soon as the course of the war permits such action to be taken and that the authority exercised by the national government during the emergency period will be returned to the states there unquestionably remains a feeling in the minds of many oil men in Texas and elsewhere that federal control will not be willingly relinquished but that in order to secure return to the state of their former prerogative it will be necessary to "go to Washington and drag it back". However unwarranted this assumption may be the tone of Secretary Ickes' letter to Chairman Jester seems to have done nothing to relieve it.

To the majority of oil men in Texas the case for state rather than federal regulation appears simple and convincing. It rests upon three main points: first, because of the scientific and practical means exercised by state authorities and the cooperation they receive from operating companies; second, because of the conservation and regulatory laws that have been evolved from practical experience; and, third, because of the familiarity of state officials with conditions in the various fields and their characteristics in production and reserves. It is held to be beyond dispute that under state regulation and conservation the oil industry became a tower of strength for the national defense; that, when war placed extreme demands upon it, it was capable of meeting undreamed-of requirements with fewer men and less materials than under much lower peacetime demands. Why, it is asked, if the pre-war system was so successful, should it be changed? And the answer is, it should not.

It is the unanimous opinion of the Railroad Commission of Texas that in the relinquishment of certain regulatory rights of control during the war and for the winning of the war Texas retained a state's right lien of authority which it fully intends to foreclose and exercise after the war. Col. Ernest O. Thompson who has seen long service as a member of the Commission and who has been particularly active in promo-

ting measures of conservation said on this point:

"I am unalterably opposed to federal control of the production of oil and gas in Texas. Texas is a sovereign state. She is able properly to conserve her own natural resources and she is doing an outstanding job in that line right now.

"We are constantly improving the laws and regulations promulgated by our state. The oil laws of Texas are the result of years of conservation experience. Our laws, rules and regulations have been given general acceptance by the operators and land and royalty owners. They have stood the test in our courts and Texas oil and gas conservation is thoroughly understood and completely indoctrinated in decisions of the law of the land.

"Our educational system is financed largely by oil and gas severence taxes. To turn our regulation over to a federal agency would place in jeopardy the state school system.

"The Interstate Oil Compact Commission was formed to make unnecessary federal oil or gas control of production. We have delivered the oil for war successfully. Texas oiled the war. Now having done the supreme job why should any federal agency be given control? We have passed the test."

Olin Culberson, the third member of the commission, holds with the others on the question of state versus federal control: "We started trading off our liberties a long time ago", he said "both state organizations, individuals and groups. Too many of us have been too quick and ready to shrug off federal control because of the promise, frequently hollow, of personal material profit. The tendency has been to look only at the near future, not the ultimate discord. There has been too great a tendency to look at profit, disregarding the giving away of personal liberties and the right to run one's own affairs.

"The state, the logical regulatory body, should have as its first objective the highest possible efficiency of the oil industry. Neither political nor other considerations should ever interpose in the application of state direction. Such mistakes must be avoided in the interest of vital and complete cooperation and understanding between regulator and regulatee."

In proof of the adequacy of state control is the excellent record Texas has made in practical conservation. The vast East Texas field, as a result of study and regulation will have produced at the time of abandonment more of the original oil in place than will have been recovered from any other major field. This will have been due chiefly to scientific and practical regulation plus cooperation from producers. During the early days of production from the field, there were numerous cases of opposition to the regulatory measures applied to production but as these measures produced results, these negative interests joined the more foresighted.

To show the effectiveness of the measures adopted in East Texas it is pointed out that the field produced nearly 8,000,000 barrels more in 1943 than in 1942 with less pressure drop. Estimates of total recovery have been increased time and again, and this is due to the success of operating methods, combining the functions of fluid withdrawals with pressures and fluids returned to the reservoir.

Since before the war, Texas has been carrying the load of the industry. This is apparent from the table below.

Year	Barrels	Percentage Change
1939	476,550,000	Plus 0.15
1940	486,662,000	Plus 2.12
1941	499,208,329	Plus 2.58
1942	477,828,220	Minus 4.28
1943	587,436,107	Plus 22.94
1944 (1st-6 mo.)	352,069,937	

During 1943, Texas produced 587,436,107 barrels of oil which represented 39.11 percent of all crude production of the United States. Present daily average production is 2,163,000 barrels from 822 oil gas and distillate fields. These fields represent 58.09 percent of the entire known national reserve of petroleum. Texas has been able to meet this demand upon these reserves only because as long ago as ten years before Pearl Harbor Texas had practiced conservation of oil and gas and proration of production to meet demand. This was the result of state regulation. It has been the backlog of the Texas oil-war effort.

Not only has Texas devised and put into practice routine measures to insure crude oil for the public good, but it has gone beyond this to initiate new methods that are equally constructive in adding to conservation in distillate fields. This new and constructive effort pertains to Lake Creek field and involves the return of stripped gas to the distillate section in order to sustain the pressure above dew point of the gas or above the minimum necessary before the heavier hydrocarbons drop out as liquids to remain in the reservoir at ultimate depletion. This new practice will enable the maximum of fluid to be recovered, with nothing but dry gas remaining in the sands when the field is economically depleted. Even then, the dry gas will be present under pressure and may be utilized as demand arises.

Recent encroachment upon the right of the state to control production of natural gas has likewise been protested by the state commission in the case of the Federal Power Commission. This is another finger toward centralization that has not gone unnoticed.

The entire picture of federal control with its many adverse ramifications typified by a story Col. E. O. Thompson likes to relate. It is an old fable, relating to the lion and its jackal. The lion had word sent through the animal kingdom that he was ill. All the denizens of the woods called to pay their proper respects to the fallen king with the exception of the fox. Upon noticing this the lion instructed the jackal again to advise the fox of his condition. Upon receiving such word the fox replied, "I am not unmindful nor disrespectful of the lion. And I ventured near his den more than once to offer my well wishes. However, I noted a strange fact. While all of the jungle animals had gone to the lion's cave, and their tracks were plainly evident in the sands, I noted that there was not a single track leading away from the cave." And so he feels about Federal control.

The Interstate Compact Commission formed in 1935 with only three member states has been an instrument of close cooperation and constructive practice among the states. At the present time, the Commission includes thirteen of the twenty-one major oil producing states, and meets quarterly to exchange views and engineering data relative to conservative practice and production engineering of oil and gas. The data so acquired is then made available to the public as well as the industry.

The states, under their own control, will each do its utmost to protect its own resources. That is to its own benefit. It will protect itself against excesses and against the encroachment of imported oils that can be contemplated under federal control. It will do more to establish price justification than a centralized body lacking first hand knowledge of local conditions and demands. And it will actively support the continued life of the many independent producers, too many of whom have ceased to exist under the war-time practice of federal direction.

It is essential that a definite plan be set in prospect now for return of control in its entirety to the oil producing states. It is as important to the petroleum industry and indirectly to the people as a whole as total reconversion is to the nation at large. Texas is already making definite plans toward this end. Other states, not so fortunate as to have established an inclusive regulatory program, should be advised now as to the steps requisite to state control in order that they may get their houses in order by legislation on the part of their state bodies meeting in January.

There is no hesitancy on the part of Texas. Its plans are laid. It has proved its capabilities. All it wants is the cooperation that PAW has many times assured would be immediately forthcoming once the war was won.

This is a fair statement of prevailing Texas sentiment backed by the determination of the state authorities to bring about the restoration of suspended regulatory rights at the earliest possible moment.

OIL—POSTWAR; A Problem of National Concern

By Ralph T. Zook*

THE petroleum industry's first postwar job is to increase the oil reserves and producing capacity of the nation. This cannot be effectively accomplished under the present price structure on crude oil. Producers, who have struggled through this war era under a frozen price while costs have risen 30 percent and more and discovery costs have gone up 300 percent over the 1940 figure, cannot properly exert the effort that is needed to restore the producing ability to the position it occupied before the war.

The gain in production which has come about was from the excess productivity built up before the war, and even that gain has had to be supplemented by drafts on aboveground storage. Reserves and daily producing ability must be expanded, and the necessary working stocks of crude oil and most products must be replenished.

Some articles in the trade press recently have indicated that a reduction in crude oil prices can be expected postwar. It is difficult to find a semblance of logic in such reasoning, unless it is assumed that the domestic industry is to be allowed to stagnate while the prosperity of foreign countries and a few large companies is to be enhanced by a program of unrestricted imports.

Crude Prices Must Increase

Instead of crude oil prices decreasing postwar, it is in the interest of the nation, the public, the states, and the oil industry that they increase. A healthy oil industry (1) guarantees the security of this nation in time of war, (2) assures the public of a continuous and adequate supply of oil and products at fair prices, (3) allows the states' natural resources to be released in an orderly manner without waste, and (4) furnishes the production branch of the oil industry with necessary funds to accomplish these results.

The industry has been producing its reserves during the war at prices for crude oil below the cost of replacement. It will continue to do so under the present price structure. There are but two approaches to the solution. One is to hold crude prices at present levels while all the elements of the producer's costs — materials, labor, and taxes — decline. This method, insofar as the writer knows, has no acceptance. All insistence today is upon the maintenance of a general price and wage level for all commodities which approximates that of the present.

The alternative is to increase the price of crude oil. The oil industry cannot function properly with the price index for crude oil so far out of line with other commodities as it is at present. Crude oil prices were not, during the period of price control, allowed to rise proportionately with other commodities, and the industry cannot function over an extended period with wages at an index of 185.7, all commodities at 103.7, and crude oil at 63.8.

Neither is it sound, as has been done in the past, to set the price of crude oil at the amount remaining after excessive transportation costs, the installation of expensive refining equipment in the race to satisfy the demands of the marketing branch of the industry (and which rapidly becomes obsolete) nor after this branch of the industry has entered into loans of money and equipment, special rental or lease arrangements, special discount or margin agreements, advertising arrangements, and free paintings of buildings and paving of driveways. Each branch of the industry should bear its own expense and show its own profit or loss.

The independent producer has maintained for years that the proper method of arriving at crude oil prices is to start with the cost of exploration, development, and production, including replacement cost, plus a reasonable profit and build from that point. This method would go far to accomplish the desired end — a healthy domestic oil industry.

The need for an increase in price is not confined to the independent branch of the industry. The augmented earnings of the larger producing companies result from greatly increased volume of production which can be expected to revert to levels in effect prior to the war. James V. Brown, petroleum analyst, writing in the August, 1944, issue of *The Independent Monthly* shows that twenty companies, one-tenth of the percent of the total oil producers in the United States, had an increase in their aggregate prduction of crude oil in 1943 or 1942 which exceeds the total increase in production for the entire United States. (Unfortunately it is these companies that are used as an illustration of the high earnings of the oil industry.) This leaves an average loss in production for the remainder of the twenty thousand oil producers. Those who have been enjoying increased volumes will, with their lower postwar production and increased costs, find themselves in the same position as the remaining nineteen thousand or more operators throughout the United States who have been operating with greatly increased costs and steady or decreased production.

Postwar Oil Demand

No one can forecast with accuracy just how much oil will be needed to maintain the degree of industrial and business activity which all agree is a safeguard against postwar economic collapse. The various estimates, however, range from 4,000,000 to 4,300,000 barrels daily of petroleum liquids. This includes crude oil, natural gasoline, condensate, and benzoil, the latter three now being produced at the rate of approximately 300,000 barrels daily. This estimated demand will vary greatly with the amount of oil exported, the amount of imports, and postwar military requirements. On the assumption that this demand will materialize and there will be little or no proration of natural gasoline, condensate, and benzoil, there will remain a daily demand of 3,700,000 to 4,000,000 barrels of crude oil production compared with the present rate of 4,700,000 barrels, a reduction of 7,000,000 to 1,000,000 barrels daily.

Mr. Paul Ryan, in the Annual Refinery Issue of this magazine, July 15, 1944, states:

> At the end of the European war, total United States demand — domestic and foreign may be expected to decline a net amount of perhaps 500,000 barrels per day below wartime levels. . . .
>
> With crude oil production high, refinery operations at peak levels, storage facilities well nigh full, severely reduced gasoline demand, and general business contracting from war operations, a downward adjustment in the prices of petroleum and its products appears to competent economists to be inevitable in the immediate postwar period. . . .
>
> Refineries, in all likelihood, will be unable to pay even the present price for crude oil and, during the early years of the immediate postwar period, reductions in the price level of crude oil will occur, in the opinion of competent authorities, particularly in crudes less acceptable in quality and less accessible in location. . . .
>
> . . . The possible occurence of such an eventuality, however, should be faced realistically and should lead to intensive study and adequate preparation.

To assume that, since crude oil production is now at its maximum rate in the history of the country, it will continue at this level postwar and cause a downward adjustment in the price of petroleum and its products, is a defeatist attitude. If a car is driven at an injurious speed to meet an emergency, there is no compulsion to drive at that speed regularly. The producing industry, answering the appeals for more and ever more production, responded at its own expense. Once the national security has been finally assured, the industry should and may be expected

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to return to the program of conservation which it built through many years of trial and error and enormous and costly effort in the fields and laboratories.

Oil Production

War requirements have given the country an opportunity to measure its capacity to produce oil at the maximum efficient rate. Those who are well informed believe that present production is conservatively 200,000 barrels daily in excess of that rate. A reduction should be welcomed in many fields. Under the urge of war needs, producers have operated wells at rates which were detrimental to the future recovery of oil from the properties. War and waste go hand in hand and the operators have, as their contribution to the war effort, responded to the call for more and more production at the expense of the energy which nature stored in the oil reservoirs.

The reduction of crude output from domestic fields will not depend wholly upon the industry's action. No abrupt decrease in demand is anticipated at the close of the European war but rather a "leveling off" period, with the major reduction taking place at the end of the Japanese war. In most calculations, 1946 is the year set as the first one after the close of the conflict. Between now and that time, nature will play its part in a natural decline which may exceed the amount of oil producible from new wells. Such a decline has been speeded up by the high rates of production during this war. There are nearly 2,000 fewer flowing wells at the end of 1943 than at the end of 1940. A further influence is the reduction in the number of producing wells drilled. In 1942 and again in 1943 the number of wells completed was only about one half that of a normal year.

Aboveground Storage

It is estimated that at the close of this war stocks of all petroleum and products will have decreased 100,000,000 barrels from the 1941 level. Crude oil will account for 45,000,000 barrels of this reduction. To bring stocks back to the 1941 level would require additions of total petroleum and its products at the rate of 100,000 barrels daily over two and one-half years, or nearly 275,000 barrels daily for a period of one year. It could be ruinous, however, for the oil industry to take the position that there should be no reduction in crude oil production until inventories have reached their previous levels.

Reserves

The maintenance of an adequate domestic supply and proved reserves is and always has been a continuous process. It has persisted since the drilling of the Drake well in Pennsylvania 85 years ago, interrupted from time to time by those periods of overproduction which have accompanied oil development throughout petroleum history.

The surest method of restoring and enlarging reserves is to increase the price of crude oil. The independents led the way in showing the need for a general price increase. They were later joined by the larger units and the Petroleum Administrator. The government has recognized the necessity of maintaining the reserves which underlie the oil fields of the nation and has put into effect a subsidy program.

While it is evidence of the necessity for financing relief for seventy-five percent of the production wells of the United States, it will not take the place of a price which should be sufficient to maintain the operation of stripper wells and provide the stimulus for the most effective development and operation of their underlying reserves. Neither this nor any other branch of the petroleum industry should be the dependent suppliant at the throne of government.

At the close of World War I, estimated proved petroleum reserves were twenty times the normal yearly production. At the close of this war, they will be only fourteen times the normal prewar production. Wallace Pratt, vice president of the Standard Oil Company of New Jersey, in a recent article expressed the view that our proved reserves should be equal to twenty times the annual production rate and that not more than one twentieth of the total should be removed from the average reservoir in any one year. Our underground reserves must be greatly enlarged to meet the definition of a healthy position.

The experience of twenty-five years ago should not be ignored in the development of our future course. At that time, the war ended with a prospective shortage of producible oil imminent in a matter of a few months. The purchasers of oil bid the price of crude from $1.98 average in 1918 to $3.07 aevrage for 1920. The result was the unleashing of the greatest wildcatting campaign in history. The high price era lasted less than two years for the discoveries were of such magnitude that a threatened shortage became a heavy surplus. Never was the effect of prices on exploration and discovery more clearly demonstrated. Discovery, in fact, far outlasted the short-lived high price era. This activity established new producing provintes and marked out areas of wildcatting and development whose reserves were measured in billions of barrels.

Conservation

Largely because of the reserves and producing ability created in that period, there developed a conservation policy which, through refinement by experience, has contributed immeasurably to the self-sufficiency of the United States in petroleum supply. This policy, reflected in the laws of the states and the administrative machinery, in the advisory work of the Interstate Oil Compact Commission, and in practices of the industry, has been shelved temporarily here and there by the demands of war; but it must be put into operation again at the earliest possible date for the future well-being of the nation.

The Public Interest

During recent months there have been suggestions, chiefly from persons whose conclusions rest upon shining superficilities, that the national oil policy shall be based on the theory that this country has depleted its petroleum resources during the war and should therefore go elsewhere in the world for its requirements and save the little that is left at home. The assumption usually is that the United States has passed its maturity as a petroleum producer and that is on the western slope heading for the "setting sun."

The adoption of a policy of importation for a major source of supply would effectively freeze domestic reserves at their present levels. Discovery effort would cease if the oil operators had no assurance of being able to sell the oil they produce.

A fact that is passed over lightly in the reasoning of those who advocate restriction of the industry at home and expansion abroad is the price of petroleum products to the consumer. It is axiomatic that the existence of a competitive industry has prevented the "cornering" of supply and distribution.

Disregarding for the moment the question of the nation's safety in time of war, it is to the public's interest to maintain a vigorous domestic oil industry. If, through unrestricted imports, the industry is crippled to the point where the nation is dependent upon other countries for the major portion of its oil supply, the public will be subject to prices which can be fixed either by those few companies who have holdings in foreign fields or through cartels initiated by foreign countries oevr which the public has no control and whose interests may be inimical to those of the United States.

It is logical to expect an alert attitude on the part of the oil producing states in the restoration of a healthy and vigorous producing industry. A consideration too frequently disregarded is the favorable effect of a strong domestic industry upon the states and the many communities where oil is produced. Picture Texas, California, Oklahoma, Illinois, Louisiana—many others—with a dying oil industry. Employment, taxation, maintenance of schools and other public institutions, and the very existence of entire communities, rest largely upon the production of oil. The millions of dollars which pass into the hands of landowners in lease bonuses, rentals, and in royalties on oil production have an effect that is well understood by those really familiar with the oil producing industry.

There are eighteen states which have substantial production, eight others which yield some quantity, locally important. It is as easy to think of a coalless West Virginia or a timberless Oregon as to imagine a Texas, an Oklahoma, or a Louisiana without oil production. With-

in a few years the industry fully expects that under a program of fair prices and with freedom from controls (except those in harmony with conservation principles) additional states will be added to the producing list and vast new reserves will be found in states which presently produce oil.

Imports-Exports

During the war period, Caribbean and South American production will have increased 375,000 barrels daily and the Middle East production 210,000 barrels daily. There will, therefore, be new producing capacity in these two areas of 575,000 to 600,000 barrels daily. The policy of the United States government concerning this "outside" producing capacity is of immediate and fundamental concern to the domestic industry and particularly to the domestic independent producer.

Ruth Sheldon, writing in the August, 1944, issue of this publication, forecast the Venezuelan situation under the new petroleum law as follows:

> Government income will be increased by the exploration and exploitation taxes to be paid by the companies upon receiving their concessions and development of new production will increase government revenue from royalties . . .
>
> The exploration programs of the various companies on these new lands undoubtedly will produce spectacular results within the next three years.

This implies that production will be further increased in that country. If so, will it absorb that part of the export market to Europe and Africa previously enjoyed by the United States? Will our government expand the good neighbor policy to the point where it will be willing to absorb the increased producing capacity that has been and is being developed? It is a possibility that cannot be ignored. To counteract it may require every ounce of energy possessed by the domestic producer.

A policy relating to imports can be no better stated than that outlined by the Standard Oil Company of New Jersey in their booklet, *Oil for the World,* issued during the early part of the year. The following quotation is in accord with the traditional policy of the Independent Petroleum Association of America on this subject.

> . . . that the importation of oil into the United States not be destructive to our own oil industry and domestic economy.
>
> When oil or oil products must be imported to supplement the domestic supplies of the United States, this should be done without so damaging our industry that the finding and development of reserves here would be hampered. Hence, imports should be admitted only for special porposes or to supply requirements that could not be met by orderly and efficient withdrawals from American fields.

Anglo-American Agreement

The producer is also concerned with the international agreement recently completed between the United States and the United Kingdom. The orderly development of world petroleum reserves is of vital interest to the domestic industry. Oil reserves of the Near East, if not developed in an orderly manner, can greatly multiply the problems of the domestic industry.

This agreement has been submitted by the President to the Senate for confirmation as a treaty. No such agreement or treaty should be made or ratified which includes provisions that could properly be interpreted as authorizing any invasion by the federal government, or any agency created by such an agreement, of the rights and the duties of the states in administration of their control over the production of our natural resources, or any invasion of the control by the Congress of the United States over the importation of natural resources. It should be made clear that any agency created shall have advisory powers only and that only oil in international trade is involved.

The National Interest

Certain lessons of value will be learned from the nation's war experience in regard to petroleum. One is that the Allied cause was saved by the reserves of the United States. This is a fact that must not be forgotten. During the many months when the oil resources of the Middle East were cut off, when Russian fields were available to the Russians only, when tankers in the Caribbean service were prime targets of the U-boats, when the oil fields of the East Indies and Burma had passed into Japanese control, it was the oil reserves and the oil industry of the United States that supplied the indispensable oil which enabled the Allies first to check the Axis gains and then to begin moving to victory.

The lesson in this is that the United States should be prepared at all times to meet its needs from its own resources. For contrast, if any contrast is needed to demonstrate the point, consider both oil and rubber. With the one the country was ready, with the other it had the unpleasant and costly experience of being dependent upon remote sources of supply, with production and transportation beyond its control. It has been embarrassed—and still is—by a shortage which has forced it to employ much industrial strength to provide a substitute.

The country does not have the rubber resources except of the synthetic kind, but it does have the petroleum, much of it still to be discovered. It must be its job, its first consideration, to set about finding the fields which will provide the same safeguard for the future that our present reserves are in the winning of this war.

To do this will require a price for crude oil that will be adequate to conduct the necessary exploration. Exploration has grown more expensive as the more obvious places to search for new fields have been prospected. All possible technical aid must be employed and there must be much drilling over wide areas. The industry has marked out for future wildcatting many hitherto unexplored regions. Scientific thought is that the continental United States holds great possibilities of new fields.

Our national oil future requires no elaborate and complex planning. It relies on the repeated assurances that wartime controls of the industry are to be ended promptly at the end of hostilities and the traditional state controls of natural resources are to be resumed. There is an established conservation policy in most of the oil states. The industry has the knowledge required to find oil and a large army of men who are by experience and ambition well qualified to apply that knowledge. Under the stimulus of a living price the industry will provide that self-sufficiency in petroleum without which the nation will be unsafe.

The oil industry as a whole has learned much of value from its wartime experiences. One thing which has been impressed clearly is the fact that a sound producing position is the most substantial basis upon which the industry can operate.

The future security, for war and peace, demands that the leaders of the industry set to work earnestly and intelligently to provide the program which will lay great stress upon the finding, development, and production of crude oil. The responsibility is divided according to interest, but the duty to insure success remains, under our system of economy, with the industry. The discharge of that responsibility in proper manner depends upon a realization of the worth of the raw material, crude oil, on which the industry is based.

During the critical adjustment period at the end of the war the action of the state regulatory bodies will have, perhaps, the most important bearing on the oil industry. If they act courageously and fearlessly to bring production in line with demand and prevent waste through holding production to the point where unneeded oil will not be placed in aboveground storage, they will have performed a great service to the oil industry and the nation. This, combined with straight thinking by the leaders of the oil industry, who should base the amount of crude oil called for on sound consumptive demand, can, not only prevent a reduction in the price of oil, but also assist the industry to regain normalcy—something it has not experienced for almost twenty years.

SUN'S STREAMLINED LUBE PLANT
Placed in Operation at Marcus Hook

By Dr. O. W. Willcox

Vaccum Distillation, Duo-Sol Extraction, MEK Dewaxing and Filtrol Fractionation Units Included in Latest and Largest Installation for Production of War Lubricants.

THE new solvent-refined lubricating oil plant erected by the Sun Oil Company at its Marcus Hook refinery is designed to accomplish in streamlined operation a task that in most refineries is carried on in disjoined sequence, and mostly by batch processes in separate plants. Here the process of making specification grades of lubrication oil is practically continuous from the time the reduced crudes are delivered from the topping towers, to the final automatic blending and packaging machines. As a result of this streamlining little intermediate storage between the different units is required, and batch handling is reduced to a low minimum.

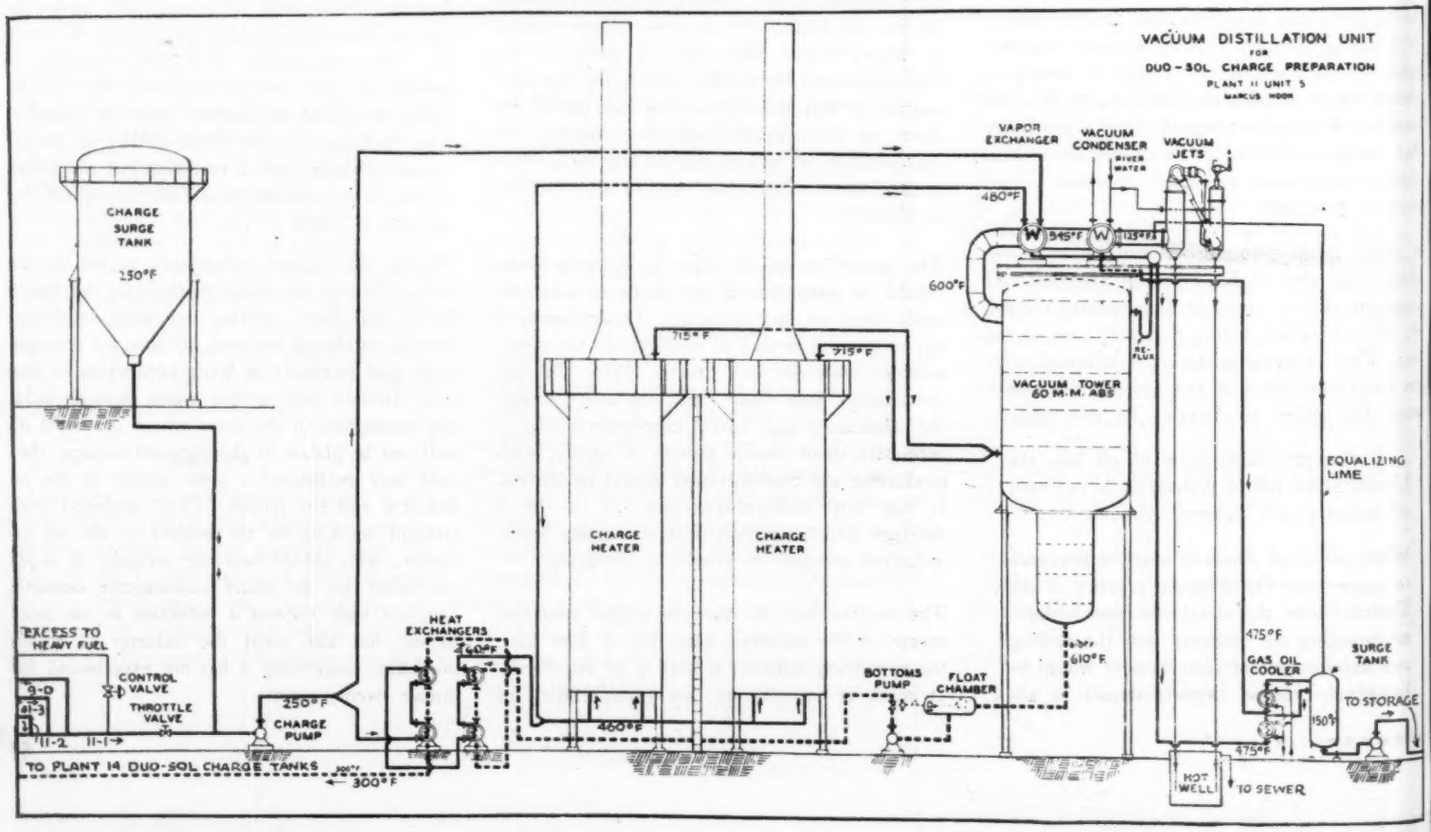
The plant consists of five closely integrated units, namely: (1) A vacuum distillation unit which selects the lube oil fractions from the reduced crudes and prepares them for Duo-Sol Process. (2) A Duo-Sol extraction unit where the undesirable asphaltic and napthenic components are simultaneously separated from the desirable lubricant values by counter-current extraction with two immiscible solvents. (3) A de-waxing unit, where the paraffinic wax is removed by the MEK-benzol process. (4) A dewaxed oil re-run with filtrol fractionation unit, where the lubricating oils undergo a final refining process and are discharged in a condition fit for blending. (5) A blending and packaging plant where specification products are automatically blended and delivered. In design and construction these five units represent skillful adaptations of more or less well known equipment and procedures. What distinguishes this new lubricating oil plant is the combination of the five stages in a single coordinated unit, in which the various steps follow conveniently and naturally one after the other, affording the condition for excellent control and supervision. Another characteristic of this streamlined installation is a high degree of flexibility, both as to the range of crude oils that may be drawn upon, and as to the number and quality of products that may be turned out.

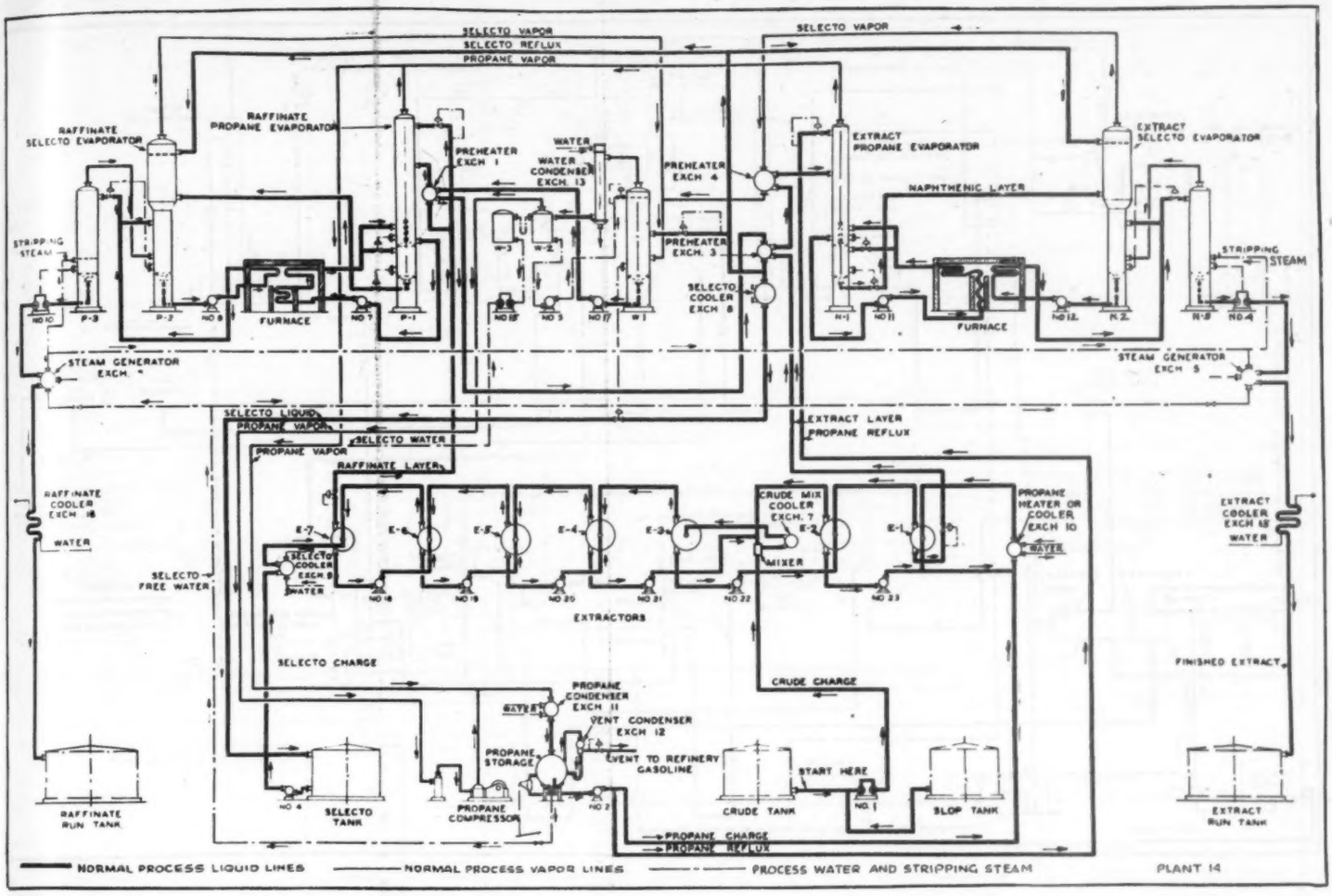
For the present, Sun's new lube plant will be devoted exclusively to the production of oils essential to the conduct of the war, principally; (a) aircraft oils of viscosity-index and other qualities corresponding to government specifications, and (b) heavy-duty or so-called detergent oils for use by the armed forces with all engines except aircraft. These oils are produced in two grades: SAE 30 and 50. Other lubricating products such as industrial, transformer, cable, cutting oils, motor oils, etc., will continue to be made in the existing units that operate by Sun's mercury vapor process. The crude supply is drawn mostly from Mid-Continent and Gulf Coast sources.

Vacuum Distillation Charge Unit

The initial operation in the production of aviation oils is conducted in this unit. The charge stock consists of tower bottoms from crude units, Plant 11 Units 1, 2 and 3 and Plant 9 Unit D, it being possible to take any combination of these units depending upon the charge rate desired. When making aircraft oil, it may be necessary to run all four units in order to obtain the charging capacity of 14,600 bbls./stream day of reduced crude. The bottoms from those sources come from exchangers at a temperature of about 250°F. and because of fluctuation in rate due to bottom tower level control operation, it is necessary to provide a surge tank ahead of the vacuum unit charge pump.

The charging pump discharge stream is divided into two portions, one being conducted through the tubes of the vapor exchanger located on top of the vacuum tower, the other passing through the tubes of the bottoms heat exchangers, the split being manually controlled to obtain approximately the same outlet temperature of both portions. The temperature of the charge is raised from an exchanger outlet of about 460°F. to a furnace outlet of 715°F., at which temperature it enters the vacuum flash tower. The vacuum tower is operated for the retention of desired lubricating oil fractions and the elimination of gas-oil (and light lubricants when operating for the production of aircraft oils), the flash point of the bottoms being controlled by the introduction of a small quantity of stripping steam. The bottoms pass through the shells of the heat exchangers and coolers and are conducted to the Duo-Sol unit charge tanks. The overhead vapors from the vacuum tower pass in series through the vapor exchanger and water-cooled vacuum condenser. The uncondensed steam and uncondensed gases and vapors are eliminated through the combination barometric condensers and vauum jets. Condensed gas-oil is withdrawn in two streams, one from the vapor exchanger, which also supplies reflux.





the other from the vacuum condenser. These streams are cooled separately and are composited in a surge tank. When operating for the production of aircraft oils, the overhead distillate is too heavy to be classed as fresh gas-oil, being considered suitable only for heavy oil cracking plant charge. It should be pointed out that a side stream can be taken from this tower, making available a fresh gas-oil product overhead; when operating for the production of motor oils, the overhead product will meet fresh gas-oil specifications.

Duo-Sol Extraction Unit

Reduced crude derived from the vacuum tower operation is accumulated and stored hot (200-225°F.) in considerable quantity, two 24,000 bbl. tanks being provided for this purpose. It is important that a constant charge quality be maintained to get the best results from the Duo-Sol Extraction Unit. The object of the Duo-Sol treatment is to take advantage of the selective solubility of two non-miscible solvents, thereby concentrating the paraffinic hydrocarbons in one layer and the naphthenic hydrocarbons in the other. The paraffinic solvent is propane; the naphthenic solvent is called "Selecto". Selecto is composed of varying proportions of phenol and cresol, depending somewhat upon the type of oil being treated and the final result desired. The relatively large difference in gravity (Selecto 1.05 sp.gr., propane .509) between the two solvents facilitates the operation which is carried out in a series of extractors in which intimate mixing is followed by a low velocity separation.

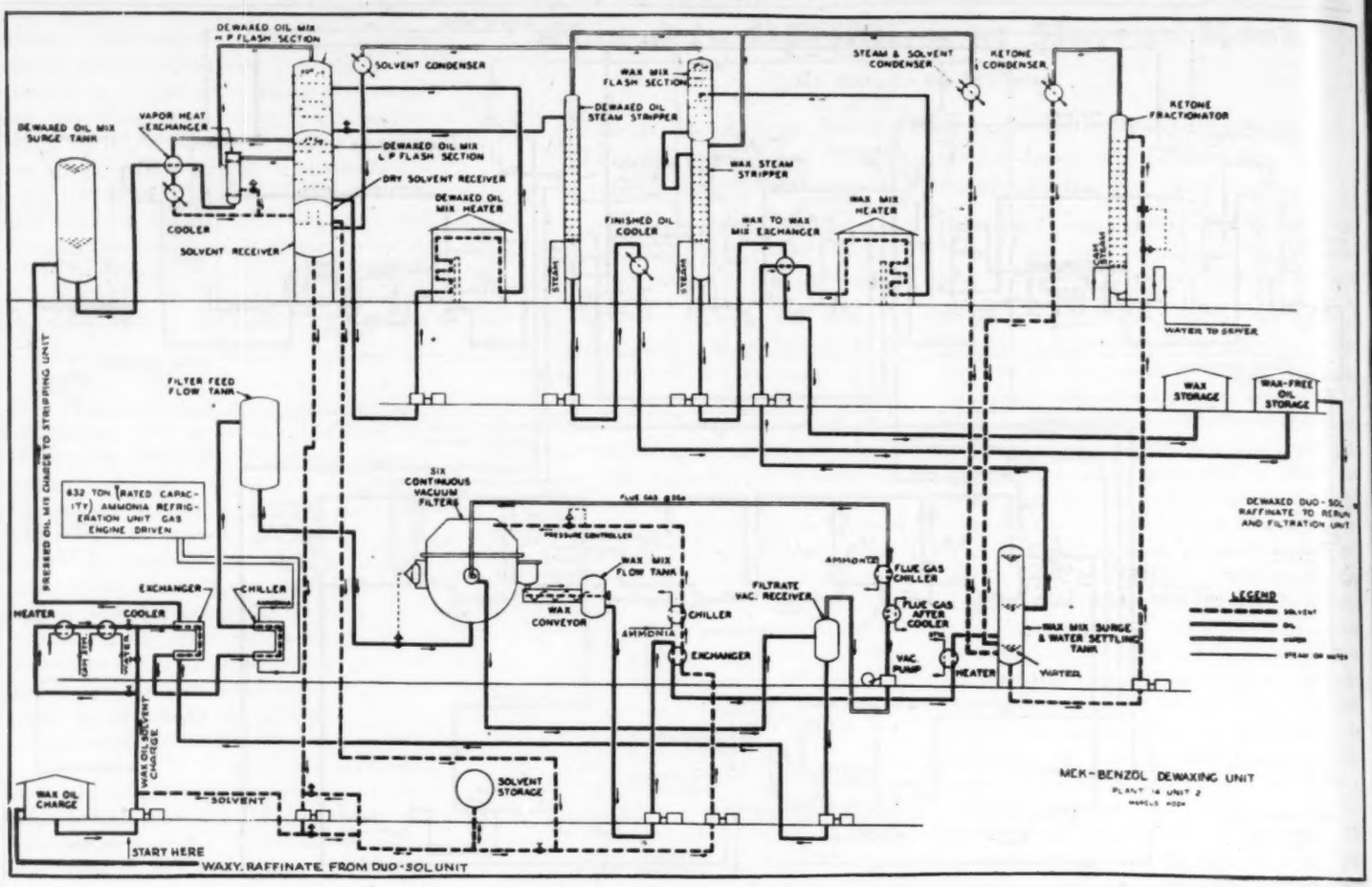
In operation, the charge oil is introduced at a controlled temperature (100 to 130) and at a pressure sufficient to keep the contents of the system in the liquid phase (approximately 300 lbs. gage) to a mixer located between the 2nd and 3rd extractors where it joins with the propane charge stream (which has already been contacted counter-current to the effluent extract stream in extractors 1 and 2), and with the Selecto stream from extractor 4, (the Selecto having been charged to extractor 7 counter-current to the effluent propane or raffinate layer). It is thus seen that the two effluent streams come from opposite ends of the series of extractors, the extract being washed by fresh propane, the raffinate being washed by fresh Selecto. The proportions of solvents to charge are from 4-6:1 for Selecto and 2-3:1 for propane.

The two solvents not being completely immiscible, it is necessary to provide for the recovery of dissolved propane and Selecto from both the raffinate and the extract. Thus, it will be seen that the recovery system consists of two complete sets of distillation and stripping towers, although products are finally combined where possible, one set of propane condensers and one set of Selecto coolers serving both recovery units. The Selecto vapors provide for most of the heat imput necessary for the vaporization of the propane thru suitable heat exchange. Selecto is stripped out of both extract and raffinate at low pressure with direct steam, steam being condensed and the water fed to the steam generator for the production of process steam, thus minimizing the loss of solvent.

The extract, containing a concentration of naphthenic oils and asphaltic materials contained in the charge, is continuously cut back with a gas-oil or a similar low viscosity product to obtain a bunker-C fuel oil specification. The raffinate containing a concentration of paraffinic oils and most of the waxes present in the charge is ready for further processing in the Dewaxing unit.

MEK-Benzol Dewaxing Unit

The MEK-Benzol Dewaxing Process utilizes the composite properties of mixtures of benzol and toluol with a ketone. Methyl-Ethyl-Ketone (MEK) is considered superior to acetone. By varying the proportions of the components of the solvent the miscibility and the wax solubility at different dilution ratios (with respect to oil and solvent) may be controlled.



In operation, the waxy Duo-Sol raffinate is mixed in predetermined proportions (approximately 3 to 1, solvent to oil) with a solvent of the optium composition (with respect to MEK, benzol and toluol), the mixture being cooled first through water-cooled tubulars, next through scraped surface exchangers against the cold filtrate, and finally to the desired temperature (approximately —20°F.) in scraped surface chillers using ammonia as a refrigerant. The chilled solution containing the crystallized wax is fed continuously to the rotary drum filters, the wax-free oil remaining in solution in the filtrate, which flows by differential pressure to the vacuum receivers. This filtrate is then pumped through exchangers to the recovery system where the solvents are distilled off and condensed, the filtered oil being finally stripped free of solvent, cooled, and stored ready for further treatment in the rerun and Filtrol fractionation unit.

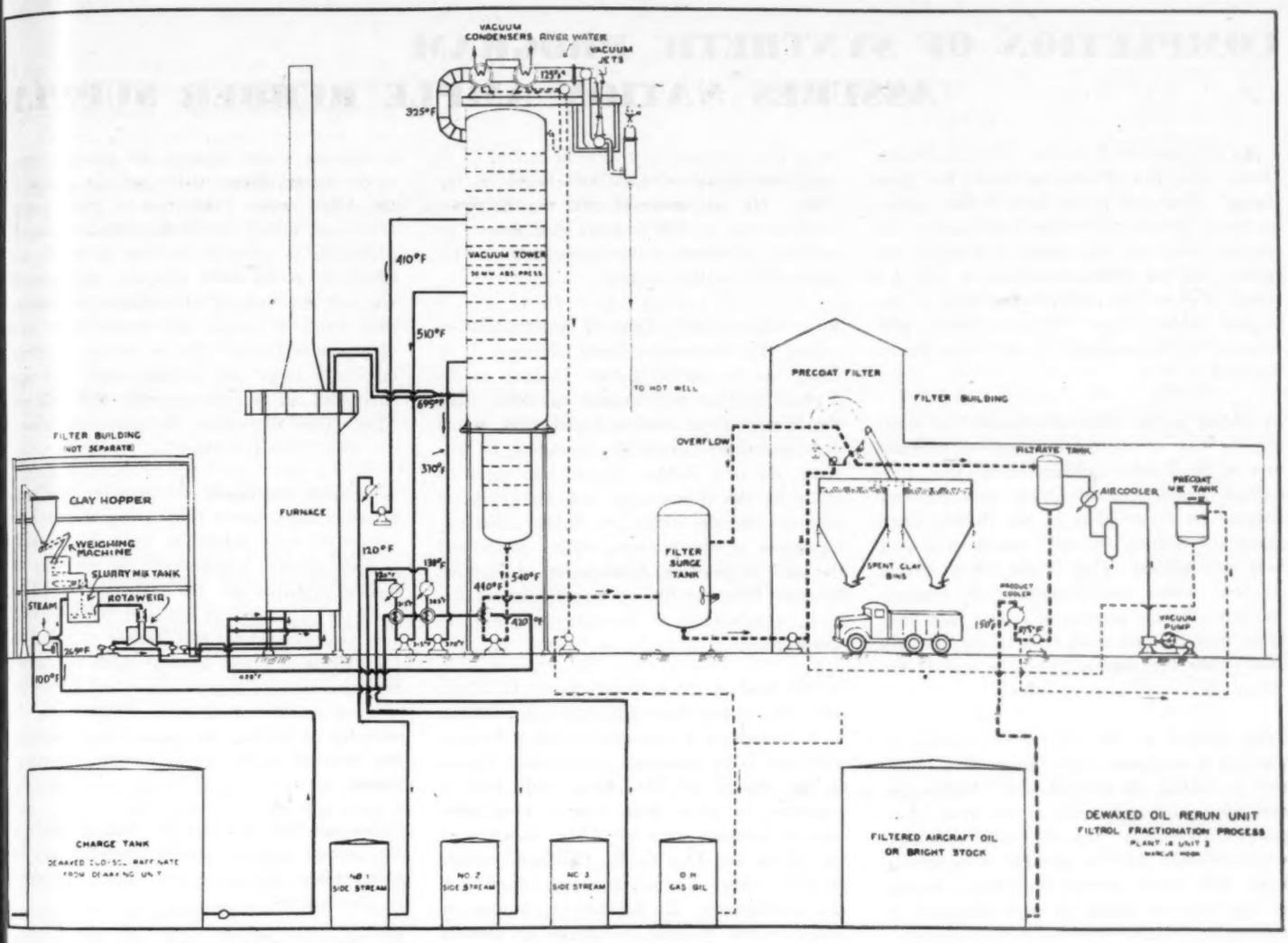
The wax contains considerable solvent and is processed in a separate recovery system where the solvent is distilled off, the traces being stripped out of the wax with steam. The water obtained from condensing the stripping steam from both recovery units is accumulated and the dissolved MEK is fractionated out of the water to prevent solvent loss. It should be pointed out that the plant is arranged for a "repulping" operation upon the wax as it comes from the filters for the purpose of reducing the oil content of the wax to a minimum.

De-Waxed Oil Re-run Unit with Filtrol Fractionation

This unit is designed to combine a contact filtration process with a vacuum tower rerun distillation. When producing aircraft oils, the function of the vacuum tower is to remove traces of light oils and decomposition products which would affect the stability and flash point of the finished oil. When running motor oils, it has the added function of producing side stream distillates of SAE 10, 20 and 30 specifications, and filtered bright stock bottoms. The dewaxed Duo-Sol raffinate is treated as follows: The charge is heated to about 265°F. and a portion, about 15% is mixed continuously with a weighed amount (say 10 lbs./bbl.) of Filtrol clay in a slurry mix tank, this slurry being added to the main charge stream at the inlet of the furnace coils. The charge containing Filtrol clay is raised to the proper temperature before entering the vacuum flash tower. Bottoms from the tower containing the fine clay in suspension is picked up by the filter charge pump from the filter surge tank and is fed continuously to a rotary drum precoat filter at a temperature of about 440°F. The hot clay-free filtrate flows by differential pressure to the vacuum filtrate receiver from where it is pumped through the product cooler to storage. The side streams require no further treatment except cooling before running to storage. A considerable amount of superheated steam is used in the vacuum tower and passes along with uncondensed oil vapors into the vacuum condensers and finally into the vacuum jets and barometric condensers. Reflux is returned by gravity and the overhead condensed gas-oil product, without further cooling, is pumped to storage.

The plant includes equipment for fresh clay unloading, storage and handling; for the disposal of spent clay; and for the special periodic pre-coating operation required to keep the filter operating efficiently. The pre-coating operation consists of periodically depositing a layer approximately two inches thick of Filtercel (diatomaceous earth) upon the outer periphery of the rotary drum by producing a slurry with a light oil, heating the mixture, and operating the filter in a special circuit for building up the pre-coat cake upon the filter drum. The filtering surface thus prepared will last from a week to ten days, the Filtrol clay being deposited on the outer surface from which it is shaved by a long, carefully-adjusted knife which gradually cuts away the pre-coat layer until it is necessary to replace it as described above.

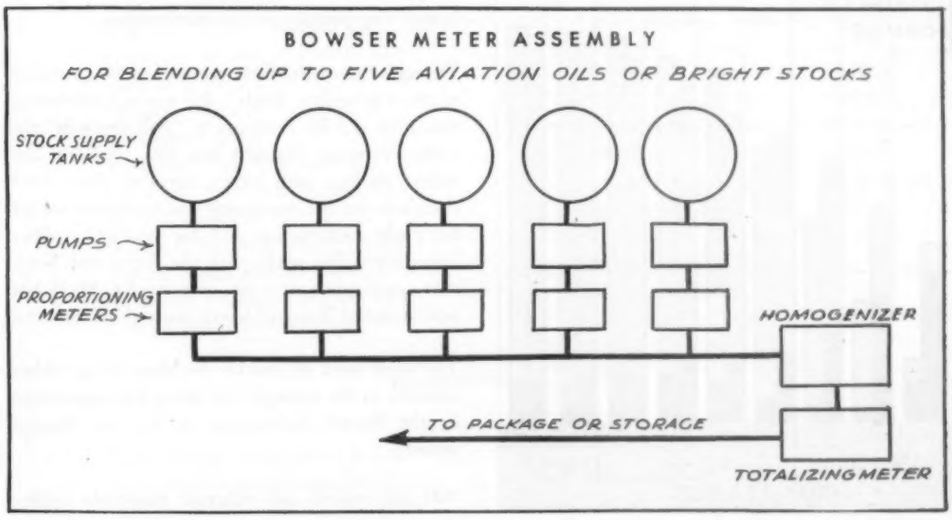
The distinctive feature of this unit is the com-



bination of rerun distillation with removal of colloidal impurities by absorption on Filtrol in the same vacuum tower. The Filtrol used in this stage of the process is an acid-treated clay in a finely powdered form (400-mesh or less) that has an enormous absorbing surface and as an absorbent is 5 to 10 times as active as fullers earth. Clay treatment is essential for removing impurities that can be disposed of in no other way. The conventional method of clay treatment of lube oils is percolation filtration in huge batch filters that occupy much space, and usually at low temperatures. In this unit a small amount of Filtrol is acting on the oil at a high temperature (560°F.) in a continuous operation. The spent Filtrol might be regenerated and used again, but its amount is so small that for the present this is not done at Marcus Hook.

Blending and Packaging Unit

The filtered aircraft oils or bright stocks that issue as bottoms or side cuts from the filters of the de-waxed oil rerun plant are separately collected in storage tanks and piped to the blending and packaging unit. This unit is equipped with a Bowser Meter Assembly which can combine five separate streams of any selection from several hundred different oils to produce any desired blend answering to any specfiication as to viscosity, gravity, fire or flash points, etc. As seen from the diagram, five receivers are arranged in a row; oil from each receiver is pumped through a meter which is set to deliver a fixed proportion of each component. The five streams merge in an homogenizer which thoroughly mixes them and passes the mixture through a totalizing meter direct to the packages or to bulk storage. There is thus no need of separate mixers or of intermediate storage.



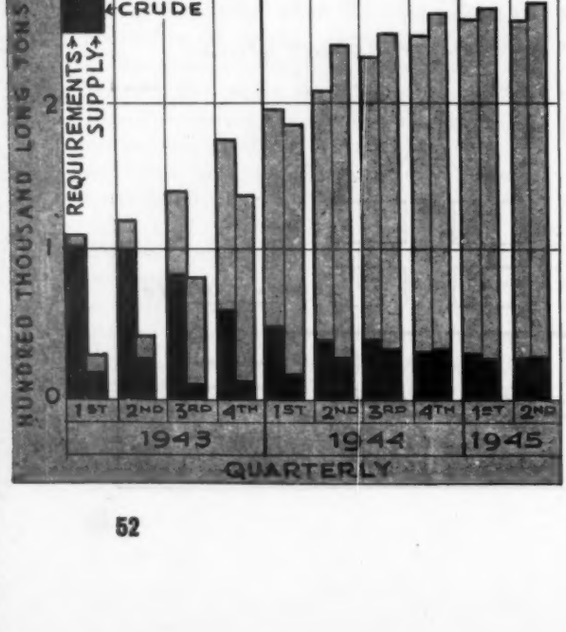
COMPLETION OF SYNTHETIC PROGRAM ASSURES NATION AMPLE RUBBER SUPPLY

As of September 1, Rubber Director Bradley Dewey gave War Production Board the "take charge" salute and turned back to that agency his board powers over rubber. His action was the first voluntary liquidation of a major war agency, and the relinquishment of a vital job turned over to him in September 1943 by the original rubber "Czar" William Jeffers, who returned to the presidency of the Union Pacific Railroad.

In folding up his independent agency and turning the rest of the synthetic rubber program over to the Rubber Division of the War Production Board, Colonel Dewey said the task assigned his organization by the Baruch Committee of "bulling through" the program had been accomplished. That is, the job of getting synthetic rubber into production in adequate amounts. But the question of getting large size, heavy duty bus and truck tires off the assembly lines of the tire manufacturers, he warned the nation, still remains to be solved.

Chief obstacle in the way of this production seems to be manpower, according to the Colonel, and in folding up the Office of Rubber Administration he took a cut at the War Manpower Commission; "Less than 6000 additional workers—about half the number to be strong, husky men—stand between the present shortage of tires and an ability to meet estimated requirements. Manpower is the unsolved problem."

In locking up his desk as Rubber Director, Dewey hurled no thunderbolts but he released two special reports emphasizing the War Manpower Commission's responsibility for securing the need manpower, and asked if these references were intended as critical he replied "I do not intend them to be critical—merely as factual." He said, however, that the manpower requirements of the program had been "repeatedly" presented to the Commission, and the plants still needed workers.



In compliance with Dewey's recommendation, Acting War Production Board Chairman J. A. Krug has set up a Rubber Division in his organization that will function somewhat along the lines of those concerned with steel, aluminum and other materials. According to Mr. Krug, the new Rubber Bureau will carry on much of the policies and activities formerly exercised by the Office of Rubber Director. Operation of the synthetic rubber plants and the work of research, development and testing, however, have been turned over to Rubber Reserve, a subsidiary of Reconstruction Finance Corporation.

At the head of the bureau is James F. Clark, who was assistant deputy director under Dewey. L. D. Tompkins, former deputy rubber director, will serve as his consultant, and Colonel Dewey at the request of Mr. Krug, will head a committee to advise from time to time when unusual problems come up. Other members of the group are Dr. E. R. Gilliland, former assistant rubber director in charge of research and development; E. B. Babcock, former assistant rubber director in charge of product development and conversion; Dr. C. C. Monrad, former assistant to Dr. Gilliland; and Mr. Tompkins.

In carrying out the task assigned to the Office of Rubber Director, both Jeffers and his successor Dewey followed pretty closely the pattern laid down by the Baruch committee as a result of its rubber survey. Jeffers frequently referred to the report as his "Bible" and Dewey followed the policies of his predecessor.

Dewey's career in office was one of the stormiest of the war agency heads. He was a hard-hitting executive and his attempts to "bull through" the rubber program brought him into frequent and bitter clashes with other agencies that were claimants for the equipment and materials needed for plant construction and for synthetic rubber ingredients. His feuds with the Army and Navy over components were not only aired publicly but behind closed doors of Congressional committees.

The vital need of quickly building up a rubber industry in the country was given top importance by the Baruch Committee in its now famous report:

"Of all critical and strategic materials rubber is the one which presents the greatest threat to the safety of our nation and the success of the Allied cause. Production of steel, copper, aluminum, alloys, or aviation gasoline may be inadequate to prosecute the war as rapidly and effectively as we could wish, but at the worst we still are assured of sufficient supplies of these items to operate our armed forces on a very powerful scale. But if we fail to secure quickly a large new rubber supply our war effort and our domestic economy both will collapse. Thus the rubber situation gives rise to our most critical problem".

The report emphasized the need for new steps to ration and conserve rubber, recommended the release of more rubber to maintain necessary civilian driving, emphasized the necessity of highest priorities for the materials needed to build the plants for the processes then approved, and recommended the appointment of a Rubber Director with broad powers which cut across the organizational responsibilities and authorities of many established agencies. Emphasizing the necessity of keeping the armed forces fighting and essential civilian wheels turning, the report stated:

"This can best be done by 'bulling through' the present gigantic rubber program and by safeguarding zealously every ounce of rubber in the country".

In stepping aside September 1, Dewey said "This most critical problem has been solved". Subject only to very minor departures, the guides set by the Baruch committee were followed by both Jeffers and Dewey.

Today, the plants of the synthetic rubber program are built and operating. Products which formerly required 80 percent of the crude rubber consumed are now being made with synthetics. Further conversions already planned and scheduled to go into effect within the next few months will further cut down the consumption of crude so that the country, according to Dewey, will be in a position to live within its income of new crude rubber.

A stockpile of more than 100,000 tons of crude rubber is still on hand and a stockpile of 104,000 tons of synthetics has been built up.

Six pilot plants are being built to pilot improvements in the processes for making GR-S, commonly known as Buna-S synthetic rubber. Laboratories in Akron owned by Rubber Reserve Company are being operated by the University of Akron to manufacture on a small scale and evaluate new types of synthetic rubbers including those presented by companies not possessing adequate piloting facilities.

A test fleet is being operated in Texas for the government by a group of the smaller tire manufacturing companies. The research facilities and test fleet give all manufacturing companies, equal opportunity for trying out their products and developing ideas for their improvement.

The rubber goods manufacturing industries have been expanded so that their facilities will soon be adequate to permit manufacture of all the rubber goods essential to the prosecution of the war and the maintenance of essential civilian activities. The requirements of the rubber goods manufacturing industry for rayon and cotton tire cords, various types of carbon blacks and special chemicals have been determined by the Office of Rubber Director and presented to the various divisions of the War Production Board which are responsible for seeing that the demands are met.

As Dewey explained "the program has been carried to a point where with reasonable manufacturing efficiency, only the failure of those responsible to supply adequate manpower, or essential components other than rubber, can result in a shortage of essential rubber goods of high quality.

"Given adequate supplies of men and components, a very small, ably staffed and well directed group should be able, with the cooperation of the rubber goods manufacturing industry, to watch over changing conditions so that essential demands are met and the industry properly guided through the reconversion period. When crude rubber is again available, it will be necessary to see that small companies are equitably treated until it is freely available to all".

Primary construction of all of the more than 50 plants in the original rubber program for the manufacture of butadiene, styrene, Buna S, Neoprene and Butyl has been completed and the plants are operating. Secondary construction, however, at many of the plants is underway incident to providing additional steam, water purification units, by-product recovery systems, and such. In most cases the components for them are already on the ground and they will be completed within the next few months without serious interference with any other important programs. A 14,000 ton per year capacity expansion of the Neoprene plant at Louisville, Kentucky, is under way and will be completed late in December.

Under approval of the Rubber Director a privately financed 10,000 ton per year butadiene plant is in construction at Bishop, Texas. This plant is being built by the Celanese Corporation of America using the aldol process and will employ petroleum gases as the basic raw material. It is expected that this unit will be in operation by the early part of next year. Pilot plant work, it is said, indicates that the process will operate satisfactorily and produce butadiene at low cost.

BUTADIENE PLANTS

	Plant Location	*Capacity (Short Tons)*
Standard Oil Co. of California	El Segundo, Calif.	15,000
Shell Chemical Division	Los Angeles, Calif.	25,000
So. California Gas Co.	Los Angeles, Calif.	30,000
Celanese Corp. of America	Bishop, Texas	10,000
Taylor Refining Co.	Corpus Christi, Texas	5,500
Humble Oil & Refining Co.	Ingleside, Texas	7,000
Phillips Petroleum Company	Borger, Texas	45,000
Sinclair Rubber Inc.	Houston, Texas	50,000
Humble Oil & Refining Co.	Baytown, Texas	30,000
Neches Butane Products Co.	Port Neches, Texas	100,000
Cities Service Refining Company	Lake Charles, La.	55,000
Standard Oil Co. of Louisiana (2 units)	Baton Rouge, La.	21,600
Lion Oil Refining Co.	El Dorado, Ark.	6,700
Carbide & Carbon Chemicals Corp. (Alcohol)	Louisville, Ky.	60,000
Carbide & Carbon Chemicals Corp. (Alcohol)	Institute, W. Va.	80,000
Sun Oil Company	Toledo, Ohio	15,000
Koppers United Co. (Alcohol)	Kobuta, Pa.	80,000
Publicker Commercial Alcohol Co.	Philadelphia, Pa.	10,000

BUTYL PLANTS

		(Long Tons)
Humble Oil & Refining Co.	Baytown, Texas	30,000
Standard Oil Co. of Louisiana	Baton Rouge, La.	38,000

STYRENE PLANTS

		(Short Tons)
Dow Chemical Co.	Los Angeles, Calif.	25,000
Dow Chemical Co.	Velasco, Texas	50,000
Monsanto Oil Co.	Texas City, Texas	51,000
Dow Chemical Co.	Midland, Mich.	4,200
Carbide & Carbon Chemicals Corp.	Institute, W. Va.	25,000
Dow Chemical Co. of Canada, Ltd.	Sarnia, Canada	10,000

COPOLYMER PLANTS

		(Long Tons)
United States Rubber Co.	Los Angeles, Calif.	30,000
Goodyear Synthetic Rubber Corp.	Los Angeles, Calif.	60,000
B. F. Goodrich Co.	Borger, Texas	45,000
B. F. Goodrich Co.	Port Neches, Texas	60,000
Firestone Tire & Rubber Co.	Port Neches, Texas	60,000
Goodyear Synthetic Rubber Corp.	Houston, Texas	60,000
General Tire & Rubber Co.	Baytown, Texas	30,000
Firestone Tire & Rubber Co.	Lake Charles, La.	60,000
Copolymer Corp.	Baton Rouge, La.	30,000
Firestone Tire & Rubber Co.	Akron, Ohio	30,000
Goodyear Synthetic Rubber Corp.	Akron, Ohio	30,000
B. F. Goodrich Co.	Louisville, Ky.	60,000
National Synthetic Rubber Corp.	Louisville, Ky.	30,000
United States Rubber Co.	Institute, W. Va.	90,000
Canadian Synthetic Rubber, Ltd.	Sarnia, Canada	30,000
United States Rubber Co.	Naugatuck, Conn.	30,000

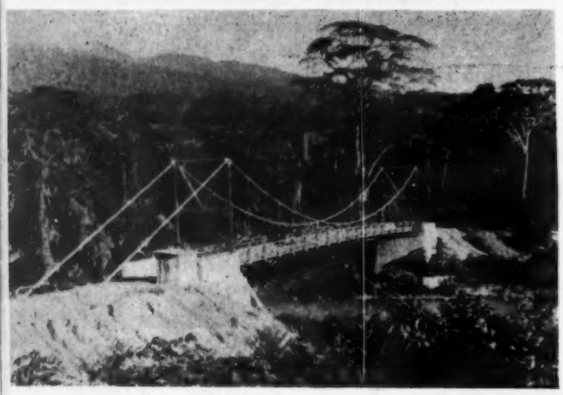
NEOPRENE PLANTS

		(Long Tons)
E. I. duPont deNemours & Co.	Louisville, Ky.	54,000
E. I. duPont deNemours & Co.	Deepwater, N. J.	9,000

Right: Fueling Pan American Plane for South America.

Below: Delivering Electric Power Plant at Tarra Camp of Sagoc.

Bottom: Material for this Bridge in Colombia was Transported Entirely by Plane.



AVIATION AND PETROLEUM IN LATIN AMERICA

By Arrigo Righi

IT is not a coincidence that several of the principal airlines operating throughout Latin America began as limited enterprises for serving the principal oil-producing areas in Mexico, Colombia, Venezuela and Peru. The obstacles presented by difficult terrain and severe climate which the petroleum prospector expects to meet in the course of his work were everywhere made more difficult by lack of facilities for transportation. The airplane, introduced shortly after the first world war, appeared made-to-order to serve as the link between new producing fields and the principal commercial centers of the various countries. It made initially unnecessary the large capital requirements for road or railway construction which could only become available after proven production had reached fairly high levels; it gave greater mobility to surveying parties and wildcat drilling crews in carrying on their work throughout extensive concessions.

Later large American and British oil companies established their own air services in Colombia and Venezuela but at first independent barnstorming aviators took to themselves the responsibility of providing speedy communications with distant fields. Pioneers in this unique type of enterprise were a small group of Americans, organized in August of 1924, to serve the Tampico area, then in the heyday of its expansion. Thus was incorporated Compania Mexicana de Aviacion. Later, in January 1929, it was sold to Pan American Airways to be developed into the largest domestic operator in Mexico.

Although Colombia has in Avianca the oldest commercial airline in Latin America, organized at the end of 1919 by some Austrian war veterans under the name of SCADTA, a great share of the credit for the phenomenal air-mindedness of the Colombians must be given to the oil companies. When the huge Barco concession was taken up by the foreign oil companies, surveying operations and preliminary prospecting were done by air. Later the construction and subsequent patrolling of the 250 miles of pipelines to the coast was also made possible by company-owned air services. In this difficult work tri-motored Fords built in the United States were the principal aircraft used.

In Venezuela also some airline pioneering had been attempted before large scale oil development began. In the middle twenties the French initiated an ambitious program of airline development throughout South America as a part of a complex system which came to be known as Air France. Political disturbances at home resulted in diminished subsidies and the Venezuelan company, Compagnie Aeropostale, became the Linea Aeropostal Venezolana through purchase by the government of the Republic. This company, along with Pan American Airways, the Dutch K. L. M. and the recently organized Avensa, furnish valuable transportation to a country in which there was a great lack of modern surface communications to the more remote areas. But to the large oil fields of the interior air services were provided by the oil companies themselves. Just before the outbreak of war private airplanes were in operation for Standard Oil of Venezuela, Mene Grande Oil Company, Venezuelan subsidiaries of Shell, Texas Company of Venezuela, Socony-Vacuum and others. An interesting side-light on this intense activity was the construction, at the expense of the oil companies, of 28 airports off the routes of the commercial airlines.

Another great petroleum producing area of South America, in northern Peru, as well as its minor extension in Ecuador, had the advantage of being on the coast and close to harbors which permitted the loading of tankers without need of surface transportation beyond the collecting lines from the oil wells. Nevertheless Pan American-Grace Airways (Panagra), the Pan American Airways affiliate which serves the west coast of South America, began its operations in 1929 by a domestic service between Lima and Talara—the center of petroleum operations for northern Peru. Its subsequent expansion to the north through Ecuador and Colombia to the

Left: Skymaster—Late Type of Transport Plane.

Below: KLM Plane at Carribean Terminal.

Canal Zone incidentally furnished direct rapid transportation to the oil fields at Salinas and Santa Elena in Ecuador. The executives of the large operators who had petroleum interests in these various countries were among those who benefited most by Pan American-Grace's development. More recently, as the oil fields in southern Boliva assumed greater value because of war needs, Panagra helped extend the airlines within that country—operated by Lloyd Aereo Boliviano—to Tarija and thus tied this oil center to the rest of the national network.

In Argentina the limited communications between the principal consuming area at Buenos Aires and the oil production centers of the north have also been actively served by Pan American-Grace Airways, and prospecting in the vast reaches of Patagonia has been made much easier by the domestic services of the Aeropostal Argentina. The latter company, operating a line which extends further south than any other in the world, has recently increased to three times weekly its schedules between Buenos Aires and Tierra del Fuego.

To the petroleum industry, as a marketer of finished products, the further development of airlines in Latin America presents interesting and difficult problems. Most amateur aviation enthusiasts who describe their vision of a sky black with airplanes of all sizes forget one of the most important operational problems, one to which the oil industry will have to apply increasing effort. This has to do with the distribution of aviation gasoline and lubricating oil. Pan American Airways and other leading airline companies have worked in close contact with the principal petroleum products distributors and their combined efforts represent a remarkable cooperative achievement, of which too little has been said.

Under the stress of war the peace time distribution has had to be expanded many times over. Naturally, because of the emergency, costs have not been the primary consideration of this vast growth, and in the interest of military transport depots and gases have been established which might have no economic justification under normal economic conditions. With the return to private transport operations, the availability of fuels and lubricants at economic prices will once again become the important factor it must be under such conditions and this will largely determine the future development of air transport operations, not only throughout Latin America but elsewhere in the world over those areas which have had limited economic development.

Recognizing the great industrial progress that is certain to take place in Latin America following the war and the increase in trade and travel between the two continents of the Western Hemisphere Pan American Airways has recently completed plans to provide mass transportation for this area at the lowest passenger rates in airline history. Under this program which has been filed with the Civil Aeronautics Board passenger transport capacity will be increased a hundredfold above its present extent and travel rates when these enlarged facilities become available will be reduced to as little as three and a half cents per mile compared with the present average rate of eight and three-quarters cents. The fare from New York to Buenos Aires will be reduced to less than $200 as compared with the present charge of $561. These low rates will apply to sit-up passengers who are expected to comprise most of the traffic. Berth or room accommodations will be provided at higher rates.

The equipment to handle the great anticipated increase will consist of three types of land planes. For long range express flights planes capable of carrying 108 passengers are contemplated; while other four-engined planes with a capacity of 60 passengers will serve intermediate points. A twin-engined transport carrying 24 persons will replace the standard DC-3 type now in use. Construction of planes for the expanded service will begin as soon as manufacturers are able to fill orders for other than military use.

In addition to the greatly enlarged facilities for handling passengers cargo capacity will be multiplied seventeen times to provide for the shipment of 30 million pounds of express annually and cargo rates will be reduced. The program of expansion calls for an increase of the company's Latin American investment to approximately $60,000,000 and the establishment of many new routes. Speeds will be substantially increased and it is expected that the time required to fly from New York to Rio de Janeiro will be reduced to twenty hours or less and between other points proportionally.

In the past oil men have been responsible for a large part, and on some routes for the major part, of all air travel between the United States and Latin America. The great projected increase in service will be of highly useful to members of the industry as it will enable them to make the jump from the United States to Central or South America as easily as from the Mid-Continent to either coast at present.

THE SYNTHINE PROCESS – A COMPOSITE OF RESEARCH

By Eugene Ayres[1]

WHILE there is substantial agreement on the subject of known domestic reserves, there is wide room for difference of opinion on the probabilities of large new discoveries. Opinions on this point are interesting but without substantial value because they merely reflect varying degrees of optimism, and it is unwise to leave the fate of our nation to chance. Hence it will be wise to carry forward the development of processes for synthetic petroleum, preferably by governmental encouragement of private enterprise. Liquid fuels have been essential for the prosecution of the present war. These fuels include aviation fuel for our planes, gasoline for our ground motorized equipment, and fuel oil for our ships. It is conceivable, of course, that there will be no "next war" or that liquid fuels will not be essential for the next war. But there are few, if any, who believe either of these things. In the light of present technology, this country would court disaster unless it assumed that perhaps twenty-four years from the conclusion of this war we *might* be attacked by a powerful foe and that in such case we would need at least as much liquid fuel as we have today. It is, therefore, generally agreed that a major problem of national security is to provide an adequate source of such fuels.

In the past, nearly all liquid fuel in this country has come from petroleum. The question of our petroleum reserves has sometimes been referred to as "controversial", but as a matter of fact, it is surprisingly non-controversial. There has been an extraordinary unanimity among technologists and statisticians, both of the petroleum industry itself and of the Government. These all agree that known oil reserves in proved U. S. oil fields are not much more than 20 billion barrels, or enough for about 12 years at the current rate of consumption if no more crude were discovered and if the 20 billion barrels could be produced as rapidly as we need it.

Some of the statements that have been made in recent months seem to be at variance with the above estimate but they are not intended to be. For example, when it is said that we shall be producing petroleum in this country for 50 years or 100 years, this merely reflects the fact that there is a limit to the rate at which petroleum can be produced. With a fixed reserve, the rate of production would steadily fall, and even if no more petroleum were discovered, a part of the present hypothetical 15 years' supply might not be produced until the year 2000.

When it is stated that U. S. known reserves are in excess of 20 billion barrels, the figure is sometimes made to include U. S. owned reserves in foreign fields, at other times our gas reserve, our reserves of other petroleum substitutes, and even assumed new discoveries. When it is said that we shall have petroleum in abundance for hundreds of years or for generations, "we" means the world—not the United States.

While there is substantial agreement on the subject of known domestic reserves, there is room for wide difference of opinion on the probabilities of large new discoveries. Opinions are interesting on this point but without substantial value because they merely reflect varying degrees of optimism, and we cannot leave the fate of the nation to chance.

One of the many great contemporary research projects is the Synthine process for the conversion of gas or coal to liquid fuels. Here is a tremendous "work of art", the first section of which was created over a period of thirty years by thousands of technical men of many nations; the second section of which is being created now by more technical men of even more nations; and the third section of which will be well under way in about ten years as world enterprise. The first section of this research is underlain with tragedy, because the primary reason for the development of the process in Germany was to provide sinews for the present war. The products have been used by the German war machine to bring misery and destruction to the world—and for little else. It is probable that the succeeding sections, while they are sure to be equally dramatic, will be associated with peace and progress.

About thirty years ago a German scientist observed that hydrogen and carbon monoxide could be made to react to form either alcohols or hydrocarbons. The processes subsequently developed by Fischer and Tropsch and others have been referred to as the Synthol process (for alcohols) and the Synthine process (for fuels). The catalytic reduction of carbon monoxide is a simple idea but is one that has been the principal theme of the Synthine process and that will continue to permeate the work to the end. By 1926 it was known that synthetic petroleum could be made from anything that can be used to produce carbon monoxide and hydrogen. The basic definition of the problem then was to create through this reaction useful petroleum products (which Germany lacked) from coal (which Germany possessed in abundance) at a cost not out of reason for government subsidy.

If the cost factor had not existed, the purely chemical development of the Synthine process would presumably have ended in 1926. There would have been no reason to seek further. The problem was solved. A plant could have been built then to produce the desired products. However, in 1926 the costs both of plant and operation would have been far beyond the capacity of even the perverted Germany economy. All of the work since that time has been dictated by economic and political considerations.

In general, research which is limited by an economic factor is far more difficult but also far more useful than research which is free from such limitation. To obtain a volatile liquid from crude petroleum by heating is simple compared with the problem of giving the volatile liquid the properties of marketable gasoline. To make marketable gasoline without regard to cost is simple compared with making it cheaply. The only justification for ignoring economies is in the case where it is meaningless or in the case (as in pure research) where economics might make an already difficult problem even more difficult.

During the second decade, the principal problem of the Synthine process was one of finding more active catalysts, and the work was done by chemists not only in Germany and Japan, but in the United States, Great Britain and France. By 1933, twenty years after it was first discovered, the process was ready for chemical engineering development. Dozens of new problems were encountered and solved, and supplementary tasks were undertaken such as the economical production of gas from coke, the continuous gasification of coal, the purification of the gas, and the conversion of the synthetic petroleum to usable products—all problems relating to cost. The magnitude of the technical effort already expended upon the process is indicated by the two thousand patents which have been issued. Research of greatest consequence requires the collaboration of the many rather than the superlative genius of the few. Industrial research is a composite of many arts—the arts of many branches of chemistry, physics, and engineering, specialized economics, design and construction, marketing and transportation.

The Synthine process is such a composite. But it is also like a symphony, for throughout this vast research, the original simple theme is present. This theme, which may be termed "reduction of carbon monoxide" is employed in the most intricate counterpoint with almost countless other themes such as pressure, velocity, time, heat radiation, strength of materials, corrosion resistance, catalyst activity, elements of design, and functional properties of products. Each theme threads its way through the maze, seemingly independent, but related with mathematical precision to all other themes—like the voices of a symphonic movement. In music we talk of harmony; in research we talk of dependent variables. The completed part of this research, although primitive, is a thing of technical grandeur and is exemplified by German plants that have been turning out nine million barrels of petroleum products per year.

The second phase of this research which is now under way in this country is still concerned

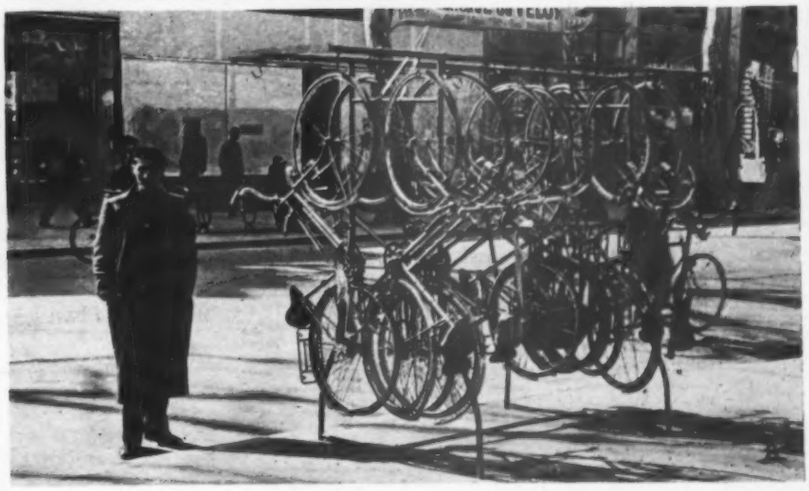
(*Continued on page* 88)

[1] *Gulf Research and Development Company, Pittsburgh, Pennsylvania.*

MEETING THE PETROLEUM SHORTAGE IN FRANCE

1. *Compressed Gas Provides Motive Power.*
2. *Gasogene Equipment Cumbers a Small Tractor.*
3. *Removing Ash from a Wood Burning Bus.*
4. *Charcoal Gas Propels a Bus on the Cote d' Azur.*
5. *Paris Streets Look Strange Without Taxis; Even Horse-Drawn Vehicles are Few.*
6. *Gasogene Operation Requires Training; Hence the School.*
7. *Man Power Substitute for the Vanished Motor Car.*
8. *Bicycle "Garage" in Nice.*

Photos from Three Lions



JOHN A. BROWN – OIL INDUSTRY LEADER

John A. Brown

IN the past ten years John A. Brown had come by general acceptance to occupy an unofficial place of leadership of the American oil industry. He reached that position, not through aggressive tactics but by unremitting devotion to the public service in connection not only with oil matters but also in civic and charitable activities. His openmindedness, tolerance and sound common sense made him a wise and valued counsellor. In an industry where personal rivalries are strong and clashes of opinion sometimes heated he enjoyed the respect of oil men of every rank from the humblest workers to the highest placed executives. His untimely death, which took place in the Royal Victoria Hospital, Montreal, Canada, on September 9, following an abdominal operation, spread sorrow among all those acquainted with his great services who felt as API President Boyd expressed that he was truly an indispensable man.

John Albert Brown was born at Hampton, Pa. on July 28, 1885, the son of John and Viola Albert Brown. He was a decendent of Rudolph Brown who was one of the early settlers of North Carolina. After attending the local public school, he entered Girard College, Philadelphia, and helped to finance his education by working as errand boy in a hardware store at five dollars a week. In 1901 he obtained a job in the auditor's office of the Pennsylvania Coal and Coke Company and rose in a few years to be head of the Credit Department.

Mr. Brown's connection with the oil industry began in 1911 when he joined a small concern in Taft, California, engaged in drilling and production. When the business was sold he obtained employment with the Cecil Rhodes group of capitalists in connection with their oil interests in Mexico. In 1917 he negotiated the sale of these properties to Standard Oil Company (N. J.) and became assistant manager of the business with headquarters at Tampico. He remained in Mexico until 1926 when he was transferred to Netherlands India in charge of Standard's operation's there.

In 1928 he returned to the United States to become vice president and later president of General Petroleum Corporation, a subsidiary of Standard Oil Company of New York. In 1934 he was called to New York to assume the presidency of Socony-Vacuum Oil Company which had been formed through amalgamation of Standard of New York and Vacuum Oil Company. In oil industry circles at the time it was understood that John D. Rockefeller, Jr. was instrumental in his selection for this position.

At the time Mr. Brown was 48. He had had a wide and varied experience that made him familiar with all phases of the oil business but much of this had been gained outside the country and he was not widely known beyond the organizations he had served. It was as head of Socony-Vacuum that he attained a national reputation. The task that he undertook in this position was to coordinate the operations of two strong but dissimilar organizations and to establish a fully integrated company. The success that attended this work is reflected in the growth of the company during this ten year period.

Between 1934 and 1943 the company more than doubled its domestic crude reserves although it took 483,000,000 barrels out of the ground in that period. Its domestic crude production rose from 96,000 barrels per day to 155,000. Its refinery capacity grew from 304,000 B/D to 390,000; its gasoline sales rose 60 percent and its profits increased from $24,000,000 to $35,000,000. The company's international position was steadily strengthened up to the outbreak of the war and it extended its interests in the Near East, the Far East and South America.

At the present time Socony-Vacuum has the second largest company-owned fleet of tankers, consisting mainly of new vessels of high speed and large carrying capacity. It has added greatly to its pipe line facilities. Its inland waterway fleet of tugs, barges and other vessels is the largest in the industry. The improvement in the company's marketing position is reflected by a 76 percent increase in sales through 2,500 fewer outlets. Mr. Brown would have been the last to claim personal credit for these gains, preferring to attribute them to the work of the company's organization, but his guiding hand is recognized as having contributed greatly to the results achieved.

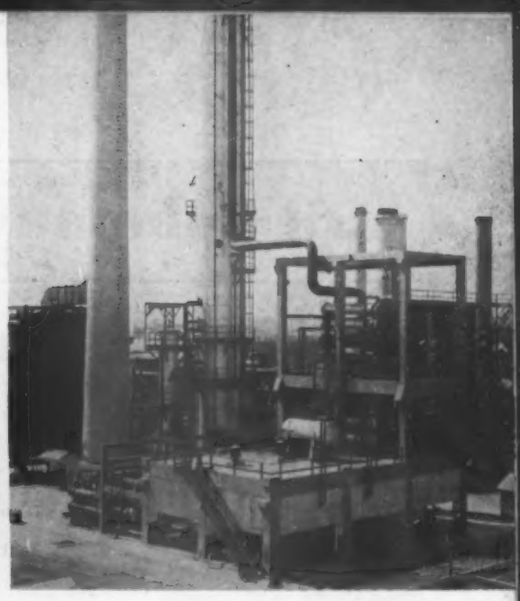
While directing the operations of a great international oil company Mr. Brown found time to participate in many outside affairs. He was a director of American Petroleum Institute and a member of its executive committee for many years. He became a director of Chase National Bank in 1934 and a member of its executive committee in 1942. He served as a director of the New York World's Fair, was chairman of the Greater New York Fund in 1940, was a vice president of the New York State Chamber of Commerce, a director of the Association of Commerce and Industry, a director of the Economic Club and was chairman of many money raising drives for charitable organizations and of important industry groups in war bond campaigns.

When the oil industry organized for war service, Mr. Brown became active in the work of the Petroleum Industry War Council, was made chairman of the general committee in District 1 and served on numerous other committees. He was selected as chairman of the National Oil Policy Committee and was one of the advisory board appointed to aid American representatives to first British-American conference.

John Brown died at the age of 59, after compressing into a few years a volume of public service such as a few men achieve over a long span of years. To his friends who know how freely he spent his energies in connection with wartime activities, he was as truly a war casualty as any man who has fallen on the field of battle. Speaking for the petroleum industry President William R. Boyd Jr. of the American Petroleum Institute said of Mr. Brown:

"No one can describe adequately the tremendous contribution John Brown made to petroleum's war program. I cannot express in words the loss his death will mean to our cooperative war effort. Connected officially in numerous capacities with the government-industry petroleum wartime organization, he gave all too generously of his strength and it is entirely true to say that he is another of our war casualties.

"Patriotic to the core, he was eager to serve, and he did serve his country at all times and under all conditions and circumstances as an able executive with a magnificent intellect and possessing all the attributes that inspire confidence and accompany real industrial leadership. The nation and his industry and his great company have lost one of their stalwarts at a time when the place of men like him just cannot be filled. He is what I would call indispensable.



Above: Crude Distillation and Naphtha Rerun Unit.
Left: Fluid Catalytic Cracking Unit. Cooling Tower in Foreground.

TEXAS COMPANY COMPLETES NEW 100-OCTANE PLANT

WITH the completion on August 31 of the alkylation and catalytic cracking units of its Los Angeles Works at Wilmington, California, The Texas Company rounded out its program of expanding facilities for supplying petroleum products for military use. Approximately $21,000,000 has been spent on the latest phase of this expansion.

Prior to Pearl Harbor this California refinery was operating at a charge rate of 30,000 barrels of crude oil per day, producing 2,000 barrels of 100 octane aviation gasoline, various grades of civilian gasolines, kerosene, stove oil, diesel oils as well as U. S. Navy special grade fuel oil and several grades of civilian fuel oils.

Immediately after the Japanese attack, The Texas Company formulated plans for the manufacture of additional military products at the Los Angeles Works. The principal objective was to increase the production of 100 octane aviation gasoline required by the military.

Included among the new operating facilities is a crude still unit capable of running 12,500 barrels per day of 36 - 42 API gravity crude oil. It consists of a pipe still furnace, a 11′ x 120′ fractionating tower, two 4′ x 11′ x 6″ stripping towers together with the required pumps, lines, condensers, coolers, and other necessary auxiliary equipment for efficient operation. This unit will produce straight run naphtha of any desired endpoint, kerosene distillate, gas oil and a straight run fuel residuum of 250 to 300 Saybolt Furol viscosity at 122°F.

This crude unit was designed to permit the refractionation of 7,500 barrels per day of 375°F straight run naphtha produced on other crude still units at this plant. This operating procedure is rather novel and eliminates the necessity of a separate rerun unit for such purposes.

The superfractionating equipment was designed for the processing of 15,000 barrels per day of combined charge made up of depropanized natural gasoline, straight run naphtha, vapor recovery compressor gasoline and any pentane and lighter fractions from the No. 1 and No. 2 alkylation plant operations.

There are six fractionating towers operating in this unit. The first column debutanizes the charge, fractionating off an iso-butane-n-butane fraction which goes to the No. 2 alkylation plant for further processing; the second column depentanizes the debutanized stock; the third column splits the pentanes fraction into iso-pentane and normal pentane; the fourth, fifth and sixth columns produce as overhead products respectively a hexanes-iso-heptane cut, and n-heptane cut, and an iso-octane cut. The bottoms from the sixth tower are n-octane and heavier. The respective products are segregated for use to the best advantage in military aviation products, motor gasoline, and for further processing.

A new unit for the production of certain desired hydrocarbon fractions by the use of catalytic cracking was installed and has started operating. This unit includes a reactor, a regenerator, a precipitator, a bubble tower and fractionating equipment. This operation consists of contacting the charge with a powdered synthetic catalyst at temperatures between 950°F and 1050°F dependent upon the final products desired.

After the reaction between the catalyst and the oil charge, which is a distillate having a distillation range between 375° to 900°F, the vapors are cooled and go to the fractionating side of this unit where the catalytic distillate is depropanized and split into butylenes, pentylenes, C6 - 185°F and fractions boiling between 185°F to 210°F; 210°F to 300°F; 300°F to 400 F, as well as light and heavy cycle gas oils. These products are delivered to storage for further processing at the alkylation units, treating plants, and other operating departments.

The fluid catalytic cracking operation is unique in its mechanical control apparatus. More than 500 control instruments are in use on this unit, the failure of any one of which could seriously affect the efficient operation of the equipment.

The new feed preparation unit is used to improve the quality of both the thermal and catalytic olefins prior to their use on the alkylation units. A caustic wash is given the thermal butylenes for mercaptan removal and a weak acid treatment is given the thermal pentylene for removal of diolefins. A return operation is provided for the removal of any polymers which might be produced in the weak acid treating operations.

The catalytic butylenes are given no treatment of any kind. The catalytic pentalenes are caustic washed for mercaptan removal and also are given a weak acid treat for diolefin removal with a resultant rerun for removal of polymers.

The new alkylation facilities consist of the necessary fractionating towers, acid contactors, neutralizing equipment and rerun stills to permit the combination of olefinic butylenes (C4) and pentylenes (C5) with iso-butane to produce alkylate which is the base for the manufacture of 100 octane aviation gasoline. During this process depropanization, deiso-butanization, and debutanization of either the charge or the resultant products take place as well as a final rerun operation to eliminate the polymers produced in the alkylation process.

The equipment in the new alkylation unit consists of 4—Stratco Type 50 contactors, an 8′ x 128′ product debutanizer, a 10′ x 126′ - 6″ deiso-butanizer, a 6′ x 87′ depropanizer, and a 7′ x 63′ final fractionator.

These installations enable the refinery to process 42,500 barrels per day of crude oil, to produce more than 12,500 barrels per day of aviation gasoline, and to turn out 2,000 barrels of additional military gasolines other than aviation grades as well as to supply essential civilian demands. More than 50 percent of the total gasoline production at the Los Angeles Works will be of aviation grade and more than 65 percent of its total gasoline manufacture is for the United States military forces.

Oil Company Staff Changes

B. Brewster Jennings

Harold F. Sheets

DIRECTORS of Socony-Vacuum Oil Company have elected Harold F. Sheets chairman of the board and B. Brewster Jennings president in succession to John A. Brown whose death occurred on September 9.

Mr. Sheets has been associated with the company for 37 years and has been a vice president since 1932. Much of his activity has been concerned with the operations of the company outside the United States. He spent 17 years in service abroad and for a good part of that time was in charge of the company's business on the European continent which included production, refining or marketing in practically every continental country outside of Russia. He is recognized as one of the best informed men in the country on the international phases of the oil business.

B. Brewster Jennings, the newly elected president, has been associated with the company for 24 years, having started as a clerk in the marine department. He was made assistant to President Brown in 1936 and became a director of the company in 1937. During the past two years he has been in charge of tanker operations for the U. S. Maritime Commission and the War Shipping Administration, resigning this position on August 1 to return to the company.

Wilbur F. Burt, chairman of the manufacturing committee of Socony-Vacuum and a director since 1939, has been elected vice president of the company and a member of the executive committee. Mr. Burt has been connected with the refinery division of the company since his graduation from college in 1912 and has been at the head of its manufacturing operations since 1935.

H. S. CHASE AND DREW L. HINES have been appointed vice-presidents of Tide Water Associated Oil Company and Richmond K. Kelly has been appointed assistant vice-president.

Mr. Chase has had more than 22 years of service with the company in refining operations. He will continue in charge of manufacturing of the company's Eastern Division. Until early last year he was general superintendent of the company's refinery at Bayonne, N. J.

Mr. Hines has had more than 21 years of service with the company in engineering, construction and transportation operations. He will continue in charge of transportation and supplies of the company's Eastern Division. Until last May he was assistant manager of transportation of the company's Western Division.

H. S. Chase

Drew L. Hines

Mr. Kelly has had more than 15 years of service with the company in connection with its Eastern Division marine transportation operations. He will continue to have charge of the company's Eastern Division marine department.

THOMAS C. McCOBB, comptroller of Standard Oil Company (N.J.) and, since 1935, member of its board of directors, has retired from these positions. Mr. McCobb has completed 42 years in the oil business and at the September board meeting fellow members presented him with a resolution in tribute to his services. Thirty-one of the 42 years have been spent with the Jersey company.

Born in Cochranton, Pa., in 1883, Mr. McCobb moved at the age of 16 to Franklin, Pa. He spent two years in his first job as billing clerk for the Erie Railroad and, in 1902, he entered the oil business as a freight clerk for the Atlantic Refining Company. In 1913 he joined the Standard Oil Company of New Jersey as an accountant in its Baltimore office, moving subsequently to the marketing division office in Charlotte, N. C., and then to the manufacturing department in New York.

Shortly after his transfer to New York, Mr. McCobb was selected to set up a system of accounting for the company's newly acquired Canadian affiliate, Imperial Oil Ltd., an assignment which took him to Peru, where the company had extensive interests. His success in this project brought his appointment as assistant secretary and assistant treasurer of Imperial. He later became secretary and treasurer.

In 1928, Mr. McCobb was called to New York as assistant comptroller of Standard Oil Company (N.J.) of which he was made comptroller in 1933. In this latter capacity he supervised the writing of a manual which set up a uniform accounting procedure for all phases of the company's activities. The manual has been translated into many foreign languages. In 1935 Mr.

Thomas C. McCobb

McCobb was elected to the board of directors of Standard Oil Company (N.J.) and was appointed an alternate member of the executive committee at that time.

He has travelled extensively throughout the Western Hemisphere and in Europe, in his business connections with the Jersey Company's interests. He is a recognized authority on accounting, and was elected, in 1943, president of the Controllers Institute of America, which includes in its membership accounting executives and comptrollers of most of the principal business concerns in America.

ERNEST C. BREEDING of Houston, Texas, has been elected comptroller of The Texas Company. He succeeds Ira McFarland, who retired September 1 after serving as comptroller for 31 years. R. G. Rankin succeeds Mr. Breeding as assistant comptroller.

Mr. Breeding, a native of McGregor, Texas, was first employed by The Texas Company in 1921 as an accountant. He was a travelling auditor for the company for several years and in 1931 was appointed auditor of Indian Refining Company. In 1932 he returned to Texaco as travelling auditor and was appointed assistant comptroller in 1939. He is a member of the Controllers Institute of America and the American Petroleum Institute.

Mr. McFarland was the oldest Texaco employe in point of service at the time of his retirement. He was born in Johnstown, Pennsylvania, and started with The Texas Company in 1902 as a stenographer. He was successively telegraph operator, bookkeeper, and paymaster. In 1911 he became general auditor and in 1913 was appointed comptroller.

Mr. Rankin, the new assistant comptroller, is a native of Chicago, and has been employed in various accounting capacities with the company since 1939. Prior to that time he served as auditor of Indian Refining Company.

RALPH B. LLOYD, president of the California Oil and Gas Association, has announced the appointment of Don E. Gilman to the newly-created office of executive vice president. The appointment follows recent consideration by the board of directors of enlarging the scope and functions of the Association. At the same time, Mr. Lloyd announced the promotion of D. S. Kilgour from the position of assistant secretary, which he has held for a number of years, to the office of secretary of the Association.

Speaking of Mr. Gilman's appointment, Mr. Lloyd said, "Don Gilman is eminently qualified, for although he has not been identified with any of the oil or associated companies, he has long been familiar with the problems of the oil industry. His wide acquaintance with petroleum people, as well as in Pacific Coast advertising, newspaper, radio and business circles, adapts him particularly to the extension work the Association expects to do".

To accept the position of executive vice president of the California Oil and Gas Association, Gilman has resigned as vice president and western executive of the Blue Network Company. Prior to that, he was vice president of the National Broadcasting Company. He has been associated with advertising, public relations and executive administration all of his business life.

DR. J. B. RATHER has been appointed a member of the Manufacturing Committee of the Socony-Vacuum Oil Company, Inc., and will be technical adviser to the committee.

Dr. Rather joined the Standard Oil Company of New York in 1918 as assistant chief chemist, later became chief chemist and, since 1932, has been manager of the general laboratories and chairman of the company's refinery process committee. He is also vice president and a director of the Neches Butane Products Company.

Ablebodied Seaman William E. Goodwin, left, and Chief Engineer Magnus K. Nelson, right, raising the new house flag recently aboard a Socony-Vacuum tanker in New York harbor. Goodwin and Nelson both have been torpedoed by enemy submarines while serving on Socony-Vacuum tankers carrying petroleum products to our fighting forces. The new house flag, which carries a flying red horse on a white background, will replace the old Socony-Vacuum flag which had been in use for more than forty years.

William H. Holaday, who has been on leave to the Petroleum Administration for War, succeeds Dr. Rather as manager of the general laboratories. Mr. Holaday was assistant director of refining for PAW.

Other members of the Socony-Vacuum Manufacturing Committee are: W. F. Burt, chairman; C. S. Teitsworth, vice-chairman; E. N. Kothe, secretary; D. L. Hooker, G. S. Dunham, S. J. Dickey and J. W. Newton.

(Continued on page 70)

Ernest C. Breeding

Dr. J. B. Rather

★ ★ ECHOES FROM THE WASHINGTON OIL FRONT ★ ★

By W. J. Maddox, Chief of World Petroleum's Washington Bureau

Washington Looks to Post-War

Sumner Pike

War agencies concerned with petroleum are trying to line up their sights on how the end of the war in the European theater, when it comes, is going to affect their activities. PAW has been holding conferences, but the conferees are not saying anything about conclusions, and it is doubtful if any have been reached. Some quarters profess to see in the resignation of J. Howard Marshall as chief counsel Administrator Ickes' decision to wind up the affairs of PAW. However, this seems unlikely. Marshall's leaving more likely was for personal reasons.

One agency that seems to have thought the thing through and to have come to a definite conclusion is the fuels division of OPA. Sumner Pike, OPA's oil pricing chief, is understood to feel very definitely that when Germany is cleaned up there will be no more need of price ceilings on crude and petroleum products. The plans of his division are being laid with this in mind.

East of the Rockies, within six to eight weeks after the end of hostilities in Europe, supplies will be ample to meet demands. And the matter of pricing and production can be turned back to the industry. Competition will make the prices, and Pike's office feels that the industry itself will level off prices and production in a way that will not run counter to the anti-trust laws and the Department of Justice. They believe the industry will seek ways of retaining some of the war-time regulations.

Oil Hearings Wait on Election

ABSORPTION of Congressmen in the political campaign has pushed the Anglo-American oil pact far into the background. Chairman Tom Connally of the Senate Foreign Relations Committee, realizing the difficulties of conducting a hearing on the subject, has postponed consideration till after the election recess. Indications are that the committee will not get down to work on it till sometime in December, and the thought is expressed by those close to the committee that nothing may be done before January.

The President's decision to treat the oil pact as a treaty and send it to the Senate for "its advice and consent to ratification" crossed up earlier expectation. It had been thought the pact would be looked on as merely an agreement between the United States and Great Britain and would not be given the status of a treaty until the signatures of other participating oil countries were affixed. However, Senate critics of the pact, among them several members of the Maloney oil policy committee, objected that the Senate and the Maloney group were being ignored. Decision to treat it as a treaty was an appeasement step.

As a further move toward placating opponents of the agreement, Connally plans to have members of the Maloney committee sit in with the Foreign Relations group at the hearings. As a matter of fact, the big Texan himself is a member of the Maloney group, as are two other members of the Foreign Relations Committee—La Follette and Vandenberg.

Oil Pact Raises Questions

J. Howard Pew

LIKE many oil men, members of the Senate Foreign Relations Committee are wondering about possibilities that may grow out of some of the general terms of the Anglo-American oil pact. The thought among some members of the committee is that if the agreement is ratified in its present language interpretation of several important sections may have to be obtained from the world court that is shaping up as a result of the "Dumbarton Oaks" conference.

Sun Oil Company President J. Howard Pew, in his letter to Foreign Relations Chairman Tom Connally, put his finger on several points in the pact about which Senators are wondering. Pew charged that the wording is "as innocuous or as vicious as its administrators desire to make it. Virtually every paragraph in this agreement contains a phrase which raises questions that to date remain unanswered".

Pew asked a number of questions: "What is the meaning of the phrase 'fair prices'? What is meant by the use of the phrase in this agreement 'production equitably distributed among the various producing countries'? Does it contemplate shutting down of oil wells in this country by governmental edict in order that oil wells in some remote part of the world may continue to produce their 'equitable' share of the oil needed to meet the estimated world demand? Is it contemplated that the exports from this country of finished products may be restricted in order that the 'sound economic advancement' of some other country may be encouraged? Does the agreement mean that at some future time the International Petroleum Commission may decide there is a surplus of oil in the world and that production in the United States should be restricted?

Sun's President says he sees in the Agreement the "possibility of a first step in what might be a carefully laid plan for a super-state cartel covering the petroleum industry in all parts of the world for the post-war years".

Oil Hearings Wait on Election

IN the President's sixteenth report on lend lease, covering the period up to June 30, the total value of petroleum products exported from the United States is stated as $1,009,000,000. Of this vast sum $732,000,000 represents products sent to the United Kingdom; $42,000,000 to the Soviet Union; $65,000,000 to Africa, the Middle East and the Mediterranean area; $162,000,000 to China, India and Australia, and $8,000,000 to other countries. No figures are given as to the quantities represented by these sums but it is evident that they run to hundreds of millions of barrels. The same report shows that oil powered engines of war supplied to members of the United Nations have a value of $8,764,000,000 including $4,374,000,000 for aircraft, $2,113,000,000 for motor vehicles and $1,816,000,000 for tanks.

Marshall Leaves PAW

J. Howard Marshall

IN the resignation of J. Howard Marshall, chief counsel and assistant deputy administrator, PAW has lost one of its top-flight men and one who has been with the organization from the beginning. During the past three years of the war emergency, Marshall has made an outstanding contribution to the success of the Government's oil agency, laying

(Continued on page 86)

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ESSO LABORATORIES ESTABLISHES ENGINE TEST STAND

LATE in September of this year the Standard Oil Company (N. J.) set in operation at Bayway, N. J. the first full-scale aircraft engine test stand designed especially for research on aviation fuels and lubricants. In this half-million dollar installation engines exceeding 2,500 horse power can be tested, and temperature and other flight conditions can be simulated.

The establishment of this remarkable installation grew out of a realization that facilities available to a petroleum refiner for testing aviation fuels were greatly inadequate and that this lack was retarding the development of new fuels and blending agents. Early in 1943 the plans for this test stand were started after inspection of a number of existing test stands operated by engine manufacturers and government agencies in this country and Canada. Military and other government departments supported Jersey's proposal to build, immediately and with the latter's funds exclusively, a test stand to be used as a research laboratory on petroleum aviation product improvement and development.

The equipment includes facilities for loading the test engine, and the necessary means for controlling and measuring and dissipating the power developed in the test, together with means for supplying and regulating fuel, lubricants, combustion air and cooling medium. This equipment is provided in sizes far larger than are considered to be in the laboratory class. For instance, 100 H.P. is needed just to supply combustion air to the carburetors; 400 H.P. is consumed in furnishing cooling air; 1100 H.P. is required for electric motors used in operating the stand. All types of engines may be tested, whether liquid or air-cooled, whether with pusher or tractor power plants. The horse power of the engine is absorbed and measured by an eddy current absorption dynamometer.

The main structure includes the test cell with its intake and exhaust stacks, the control room, the equipment room, the service room and, on mezzanine floors, two fan rooms, an air filter chamber, and a weigh scale room. The test cell, stacks and fan rooms are of heavy reinforced concrete construction with walls from 12 in. to 16 in. thick. Other portions of the structure are built with brick walls, wood rafters, and gypsum roofing.

Due to the extremely high level of sound intensity which will obtain in the test cell (about 135 decibels), careful attention has been given to minimizing the transmission of sound to the control room and to the surrounding area outside the stand. The primary step taken was to line the 16-in. thick concrete walls of the test cell with a 4-in. layer of sound absorbing tile.

Both the inlet and the outlet stack have been packed with sound absorbing artificial stone, having the appearance of a fine grained cinder concrete, moulded into large hollow blocks which when laid in place leave about half of the stack area as free air space. Sound waves while finding their way out through the stacks are reflected from the rough surfaces so many times that much of their energy is lost. A reduction of 25 decibels is expected in the sound level outside the stacks as compared to the conditions inside the test cell. While 25 decibels does not look like a very considerable reduction when compared to the initial level, it should be remembered that the energy in sound is halved for each reduction of 3 decibels. A reduction of 24 decibels accordingly reduces the power in the sound to one two hundred fifty-sixth of its initial value.

In order to reduce or damp the vibrations from the engine, the entire rotating assembly, consisting of the test engine, stub shaft and dynamometer, is mounted on a massive block of concrete weighing 240 tons which is doweled to the pile cap foundation. The instruments in the control room have been isolated from the rest of the structure by building the control room as a separate unit, free from the walls on all sides, supported on blocks of cork designed to absorb the remaining vibration.

The control room is furnished with a ventilating system which provides a constant supply of fresh filtered air, heated when necessary, under a slight pressure. The pressure is maintained so that it is just above that existing in the test cell to eliminate the possibilities of exhaust gases from the cell leaking into the control room. A service room 34 ft. x 23 ft. has been provided next to the outlet end of the test cell. It provides space for preparing engines for test, making minor repairs, tool storage, etc. Monorails, chain hoists, and portable engine mounts are available to handle engines between the service room and the test cell.

The test stand as now completed, with its special necessary facilities, is believed, by the company, to be the finest aviation test stand in existence for quick and accurate studies, such as:

(1) The testing in actual engines of exploratory fuel blends to evaluate existing processes for making high-octane aviation gasoline components, and more particularly the testing of new processes, thus enabling decisions to be made as to desirability for commercial production. It will also permit the evaluation on a relative basis of the components now available for the blending of aviation gasoline.

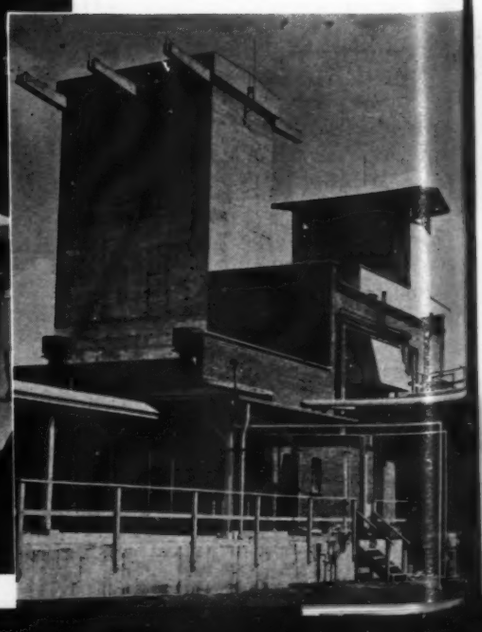
(2) Influence of engine operating variables on fuel performance and anti-knock behavior, e.g., effect of speed, spark advance, mixture ratio and automatic ratio control, temperature, compression ratio, and pressure as influenced by supercharger (blower), gear ratio, etc.

(3) Anti-knock requirements of engines operating under combinations of the above variables, and particularly those combinations found to exist in practice.

(4) Fuel-to-cylinder distribution pattern of engines operating under combinations of above variables, when using fuels of different volatility characteristics.

(5) Closely allied with the preceding study would be the influence of distribution on the behavior of fuels having their anti-knock quality controlled within the distillation range and thereby permit of setting a specification to insure optimum performance over a wide range of conditions.

Left: Installing Engine in Test Cell.



Aviation Fuels Test Stand.

You can see round the bend.

Barden Bridge, Wharfedale. (One of the W. P. Butterfield Series of Yorkshire Dales scenes.)

THOUGH SOME DETAILS may be lacking, the post-war Transport picture is now fairly clear. For some time to come industrial and agricultural journeys will have precedence as now, and as part of the national economy 'bulk' means of handling will apply whenever possible. For essential loads such as Petroleum and Fuel Oil that means—Road Tanks.

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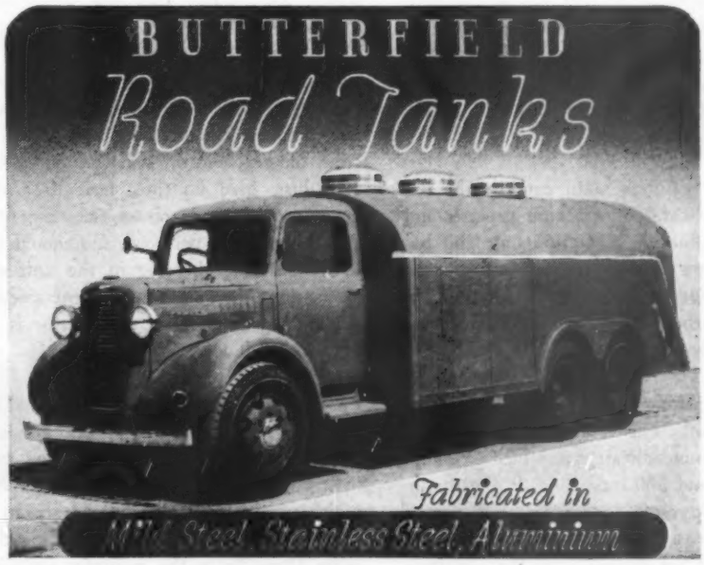

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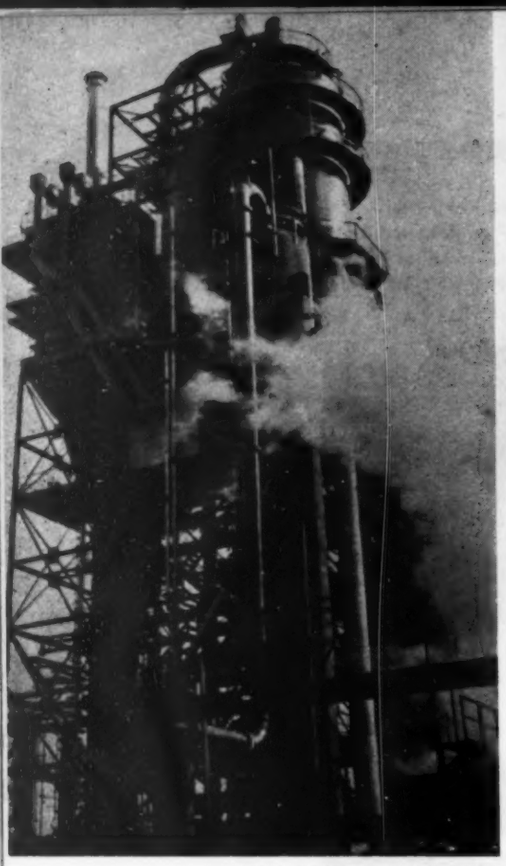
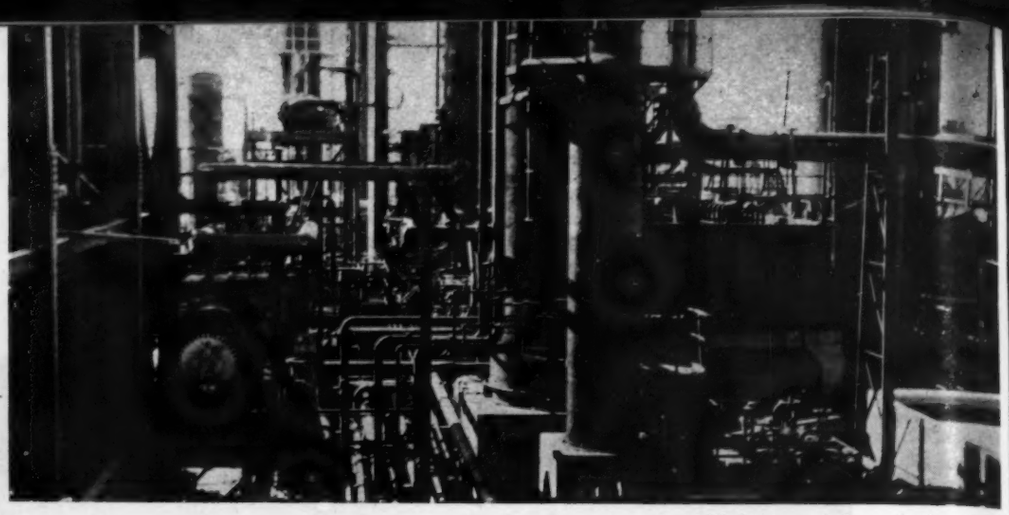


Fluid Catalytic Cracking Unit.



Alkylation and Isomerization Units.

SMALL CATALYTIC CRACKING UNIT EFFICIENT

AMONG the new plants recently built for the production of 100-octane gasoline is the one operated by the Root Petroleum company at El Dorado, Arkansas, in connection with the previously existing thermal cracking refinery having a daily crude-charging capacity of 12,000 bbl/day of crude oil drawn mainly from the fields of southern Arkansas.

This new 100-octane gasoline plant embodies most of the latest ideas that have been developed in this field. Its particular interest lies in the fact that it has one of the smallest catalytic cracking units — charging capacity: 4500 bbl. of gas oil of kerosene — that has so far been built. It has been in successful operation since April 1, 1944, and appears to provide a conclusive demonstration that relatively small catalytic cracking units will be practicable in the post war period.

This 100-octane gasoline plant employs the U.-O. P. fluid-flow catalytic cracking process, and has a hydrogen fluoride alkylation unit and butane isomerization unit which operates by the aluminum chloride — hydrochloric acid process. It was built by the Frick-Reid Supply Corporation at the cost of approximately $6,500,000.

The catalytic cracking unit consists of a reactor and a regenerator. The catalyst employed is of the synthetic alumino-silicate type which is ground to between 50 and 300 mesh, mostly 200 mesh. The gas oil or kerosene to be cracked is heated in a gas-fired furnace to 500°F., and after meeting the stream of hot catalyst from the regenerator its temperature is raised to about 900°F. The velocity of the mixture of the dusty catalyst and vaporized oil entering the reactor is such that most of the catalyst is blown from below somewhat less than half way up the reactor, and settles back along the sides to an outlet that conveys it to the regenerator. The cracking unit as a whole has a capacity for 120 tons of catalyst which circulates back and forth through the system at a rate of about 4.5 tons a minute. The cracked oil vapors, as they pass out of the reactor, are freed from most of the entrained catalyst dust by a cyclone separator and an electric precipitator, but a small amount of the dust passes from the reactor into the attached fractionator where it is separated with the heavy oil bottoms and returned to the process. The rate of conversion in the reactor to aviation base stock is about 25 percent, figured on the gas oil charge. Side cuts of recycle, furnace, or diesel oil are taken from the fractionating tower according to need; the bottoms containing the entrained catalyst are 16°/A. P. I. The overhead, which contains all products boiling below 400°F, is accumulated for retreatment to aviation base stock in the same unit.

The spent catalyst which refluxes out of the reactorator is blown with air into the regenerator, where the carbon that has deposited on the grains of catalyst is burned off at a temperature of about 1050°F. Here again most of the catalyst rises part way up the regenerating vessel and falls back to an outlet at the bottom for return to the reactor. The hot combustion gases from the regenerator, still containing some catalyst dust, give up their heat to a stream regenerator which furnishes the refinery with 4,-200 lbs. of steam per hour, and enough other heat to do all other heating in the unit except for preheating the oil charge; entrained catalyst leaving the top of the regenerator is recovered by a Cottrell electric precipitator.

For building up the aviation base stock to 100-octane grade the plant has an alkylation unit which is supplied with butanes and other light hydrocarbons coming from a gas concentrator which works on all the light fractions gathered from various topping, thermal cracking and other units throughout the refinery, including light gases from the catalytic cracking unit itself. Since these by-products do not contain enough isobutane for the alkylation plant, the refinery is also provided with an isomerization unit which, as stated, operates by hydrogen fluoride-hydrochloric acid process. The isomerizing operation is conducted at about 190°F. and 40 to 50 percent of the butane charged is converted to isobutane in a once-through passage. The capacity of this isomerizing unit is 225 bbl/day of isobutane, but it has been operated at the rate of 300 bbl. The outflow is deisobutanized and the isobutane produced goes directly to the alkylation unit while the unreacted butane is recycled.

The alkylation unit receives the mixture of isobutane, normal butane, butenes and propylenes delivered to it from various sources and subjects it to the catalytic action of anhydrons hydrofluoric acid (HF). A considerable portion of the C5 hydrocarbons produced in the refinery is also included in the alkylation feed, which in general contains about 30 percent of isobutane and up to 40 percent of olefins. The isoparaffin-olefin ratio is about eleven to one; the reaction temperature is about 90°F. and contact time 25 minutes. The yield of finished alkylate is around 1.6 bbl. per bbl. of olefin, and has an octane rating of about 91.5 (method 3C). The rated capacity of this alkylation unit is 900 bbl/day, but is now producing at the rate of 1300 to 1400 bbl. The mixed crude oil worked at this refinery has an average of about 0.8 percent sulfur, which in the final base stock is reduced to 0.05 percent with the help of a Girbotol desulfurizing unit.

This 100-octane gasoline plant is provided with the usual accessories in the way of pumps, valves and compressors, and with columns for separating the products for the various operations. The gaseous products which arrive at the concentration plant at different pressures are handled by three-stage compressors and compressed to 215 lbs. gage for the deethanizing column; catalytic gases leave the system at about 3 lbs.

As stated, this plant is interesting as being among the smaller ones included in the current aviation gasoline program. So far as concerns yields and general smoothness of operation it has come up to expectations. Whether a plant of this size can survive under competitive conditions after the war is something for the future to answer.

Revolutionizing an industry

ONE of the leading Research Engineers had stated in the course of a paper that there had been no basic changes in steel for twenty-five years and that he sees no immediate prospect of any such changes.

He goes on, however, to say that by adapting certain well-known processes, immense improvements can be made. This is illustrated by the fundamental changes which were made when " Newall Hitensile " bolts were developed many years ago.

The introduction of " Newalloy " which followed after a long interval of experiment and research, carried the strength of bolts to the highest point which they have yet reached.

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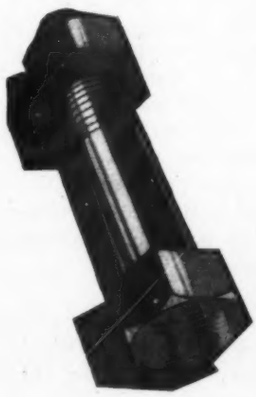
" Newall Hi-tem " are, more or less, the same as " Newallastic " with the essential difference that they are made in steel possessing non-creep qualities.

This is a short résumé of the development of Newall bolts which are all branded with their distinctive marks.



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PETROLEUM CLOUD MAKER AIDS U. S. ADVANCE

IN the invasion of Germany now under way the Chemical Warfare Service of the U. S. Army is finding new opportunities for the employment of various special devices for which there has been relatively little use in the preceding campaigns in France and Italy. In a special dispatch to the New York Herald Tribune on September 10, correspondent Joseph Driscoll described how the smoke generator, developed by the National Defense Research Council in conjunction with Standard Oil Development Company and using petroleum fuel, enabled the Third Army to force a crossing of the Moselle River.

"Prior to today several crossings of the Moselle had been reported", wrote Mr. Driscoll, "but they were tentative and experimental and not altogether permanent. Today what tanks and artillery had failed to accomplish was achieved by chemical warfare in co-operation with the air force.

"While the dive-bombers were neutralizing the forts, chemical warfare moved up a battery of smoke generators. Under cover of this artificial fog the first Moselle crossing in large numbers was effected below Metz.

"Confronted with shortages of ammunition, the Germans cannot afford to fire endlessly into vast areas of fog where they cannot see their targets. Thus enveloped in a protective mist, our infantry got across to come at close grips with the enemy. The wind was blowing down against the Germans, and our synthetic fog blended well with the natural morning mist rising from the forest and the meadows of Lorraine.

"Working in their own fog, our troops could see for short distances. They could see each other, but the enemy on the far shore and the ridges could not see them.

"Later the wind shifted in the opposite direction, but our chemical warfare was equal to the problem. First, they had generated fog across the river to blind the Germans. Now they installed smoke pots on the far shore which accomplished the same results. The Germans were being pushed back to Germany with smoke in their eyes."

Smoke Generator Demonstrating the Manner in Which it Throws a Smoke Blanket into the Air.

ENGINEERING FIRM HAS BUILT FIFTY WAR PLANTS

WITH the completion last month of a refinery installation for The Texas Co., at Wilmington, Calif., The M. W. Kellogg Company, petro-chemical engineers, brought to a conclusion a three year wartime engineering and construction program which both as a war contribution and in its post-war significance, sets a new record for the industry. The program was geared to meet the nation's demand for three vital war products: high octane gasoline blends for aviation fuel, butadiene for synthetic rubber, and toluene and ammonia for explosives.

The undertaking represented a total investment by the petroleum refining industry amounting to hundreds of millions of dollars. It comprised the engineering and construction of more than 50 installations. These included 19 Fluid Catalytic-Cracking units for the production of aviation gasoline. This part of the program was of major importance. Kellogg's construction of Fluid Catalytic-Cracking units totalled 67 percent of the entire fresh feed capacity developed by the industry for the 100 octane war program.

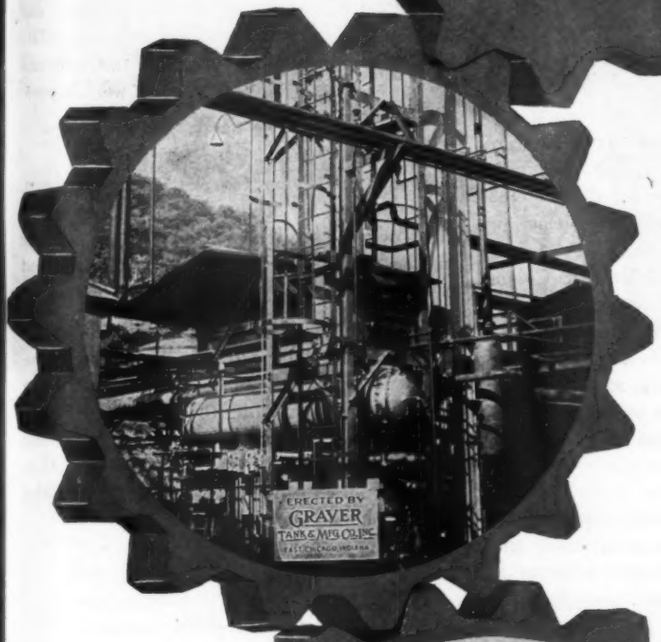
These basic cracking facilities constituted the framework for the extensive construction by the industry as a whole of facilities for alkylation and isomerization, supplementary processes employed in production of aviation gasoline. The program included 25 alkylation and isomerization plants for conversion of gaseous products into aviation alkylate, a constituent of aviation gasoline.

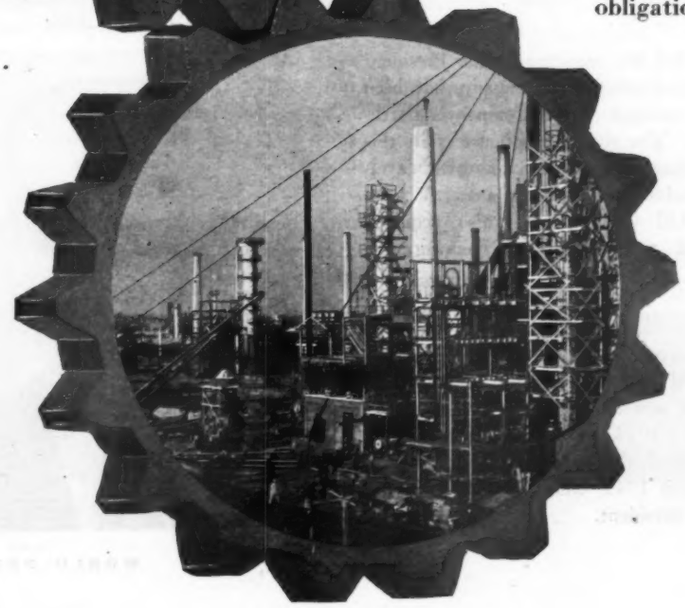
Long pioneers in the field of hydroforming—the process employed in making low quality naphthas suitable components for high octane motor fuels—which process assumed wartime importance for the production of toluene for explosives, the Kellogg Company likewise undertook its fullest capacity of work in that division, and four hydroformers were added to the program. To supply butadiene, essential for production of synthetic rubber, three complete butadiene plants were built.

An outstanding feature of the program was the large Cities Service Refining Company gasoline and synthetic rubber project at Lake Charles, La. This project, completed last May was the first modern and fully-integrated refinery to be built in the United States in 20 years. The project, which transformed a square mile of dense forest into a vast industrial community, was engineered and constructed by Kellogg from "cat-crackers" to power houses and docks. It was the world's largest refinery project ever carried to successful completion under a single company responsibility.

Constructed for 17 of the principal oil refining companies, most of these units of the war program are located in the United States, the chief centers being Louisiana, Texas, Indiana, Illinois, Wyoming, Maryland, California, and Utah. However, the program also embraced major projects for other members of the United Nations, including extensive new facilities in Iran, Canada and the Netherlands West Indies.

CONSTRUCTION... Geared to Industry's EXPANSION PROGRAM





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OIL COMPANY STAFF CHANGES

(Continued from page 61)

W. J. (BILL) NUTTO recently resigned as sales manager of the Reed Roller Bit Co. to assume the duties of sales manager of the Hunt Tool Co. of Houston, Texas.

W. J. (Bill) Nutto

After securing his degree in mechanical engineering in 1922, Mr. Nutto spent seven years in engineering and sales of mining machinery and other pneumatic equipment and then entered the oil industry as Mid-Continent manager of the Oil Tool Division of Chicago Pneumatic Tool Co. He joined Reed Roller Bit Co. in 1933 and, after a year in Oklahoma, spent several years covering all South American and Mexican fields. Then followed two years service as export manager in New York, after which he was moved to Houston to act as assistant sales manager. For the past two and a half years he has been general sales manager.

Hunt Tool Co. has considerably expanded its facilities for the manufacture of oil tools and the appointment of a general sales manager is a part of this expansion program.

R. B. CURRAN, assistant to the President O. C. Schorp, Carter Oil Company, has been advanced to manager of the Company's northwest division. The firm's headquarters in this area is at Billings. In addition to recent development of production in Montana and Wyoming, Carter Oil Company has also acquired marketing and refining facilities serving this area.

Curran is a graduate of University of Oklahoma with a degree in geology. His connection with Carter Oil Company began in the Seminole area where he was employed in the geological department. In 1938, he was moved to Tulsa where he headed the scouting and statistical department until 1943, when he was made assistant to the president.

Concurrent with Curran's move from Tulsa, C. D. Watson, engineer and director of the company, who has been located in Washington for the past two and a half years, is returning to Tulsa where he will administer conservation and kindred departmental duties. Watson, a graduate of University of Kansas, has been with the firm since 1916. In 1919 he was made chief engineer and in 1936 a director. He is one of the best known proration and conservation authorities in the petroleum industry.

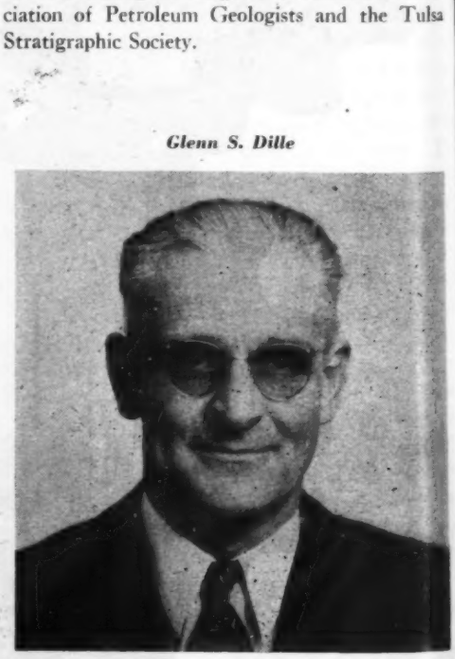
THREE new members from the petroleum industry have been elected by the Controllers Institute of America—John McFarland, manager of the tax department of the Sun Oil Company; William A. Jackson, assistant comptroller of the Standard Oil Co. of New Jersey; and William H. Garbade, assistant treasurer of the Shell Oil Company, Inc.

GLENN S. DILLE, well known geologist and consultant in the Mid-Continent area since 1936, assumed the duties of manager of the land and geological department of Deep Rock Oil Corporation from September 1.

A graduate of the State University of Iowa, Dille obtained his doctorate in 1929. As a geologist with The Texas Company he became familiar with the entire Mid-Continent area, and in 1936 he entered private geological practice.

Mr. Dille has been active in professional geological work, and served as president of Tulsa Geological Society during the 1941-42 year. He is a member of American Institute of Mining and Metallurgical Engineers, American Association of Petroleum Geologists and the Tulsa Stratigraphic Society.

Glenn S. Dille



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Summaries of the Most Important Articles as Published in the Oil Press of the World Dealing with Technical and Economic Aspects of the Petroleum Industry—Edited by Dr. O. W. Willcox.

DRILLING

The Franklin Horizontal Well Project—W. M. Shoemaker, before Independent Petroleum Association of America, Tulsa Meeting, April, 1944.

The drilling of horizontal wells into the sand from a vertically sunk shaft, thereby enormously increasing the amount of sand exposed per well with the consequent increased production, has for many years been the theory of Leo. Ranney.

In 1937 Ranney drilled a horizontal hole to a depth of some 900 feet in an outcrop of the Cow Run sand and later drilled several wells from a shallow pit. Both of these projects were located near McConnelsville in southwestern Ohio.

These experiments showed some promise, although the project with the pit was never fully completed. In 1942 the Venango Development Corporation was formed for a purpose of sinking a shaft and drilling the horizontal wells therefrom in order that the claims for the method made by Ranney could be thoroughly tested. A lease of 400 acres in a square was secured in the Franklin Heavy District in Two Mile Run near Franklin, Pennsylvania. An 8-foot diameter shaft was dug; water, oil, air, etc. pipes were hung, and the shaft lined with 14 inches of concrete to a depth of 370 feet. At this point the excavating and lining of the work chamber was started and that was completed to a depth of 430 feet.

The horizontal wells were drilled in pairs diametrically opposite—one hole being used as a rat hole in pulling the pipe. The first two holes were started with a 5-inch diamond core bit and after drilling a distance of approximately 100 feet with this bit, this section of the hole was cased and the casing grouted in. The hole was then reduced to 3 inches in diameter. The first two holes were completed at 2255 feet and 2334 feet.

The holes were loaded with 80 percent high velocity gelatin. The method used in loading the holes was to pack a 10 foot aluminum tube with the dynamite, each tube having a string of cordite running its full length. Those tubes were then pushed in the hole using the rods and rod pullers. The holes were leaded within 400 feet of the work chamber and were shot.

It was not until recently that both holes were cleaned out. During the shut-down period experiments were made with rotary rock bits and it was found that the rotary bits worked satisfactorily. These bits have the advantage over diamond core bits inasmuch as they are very much less expensive, drilling time is cut down and they eliminate the handling of cores. At the present time the drilling of two more holes is under way. The oil sand is 50 ft. thick, well saturated with high viscosity oil but little or no gas. Production figures are not yet available.

Geologic Use of Drilling-Time Data—G. Frederick Shepperd and Gordon I. Atwater, before HOUSTON GEOLOGICAL SOCIETY, February, 1944; Oil Weekly, July 3 and 10, 1944.

The authors report on experience with a semi-automatic drilling-time recorder used on twenty-eight wells drilled in three states through a stratigraphic range from early Miocene to Lower Cretaceous.

The chief advantage of time drilling to an oil-field geologist is the availability of subsurface control of a well while it is being drilled. Information is obtained for correlation, wire line and side wall coring, measurement checks, reserve estimates, and insurance against loss of the lithologic record before an electrical log is run. While mud characteristics, rotary speed, drilling weight, type of bit and other factors are not without influence, lithology is the control-

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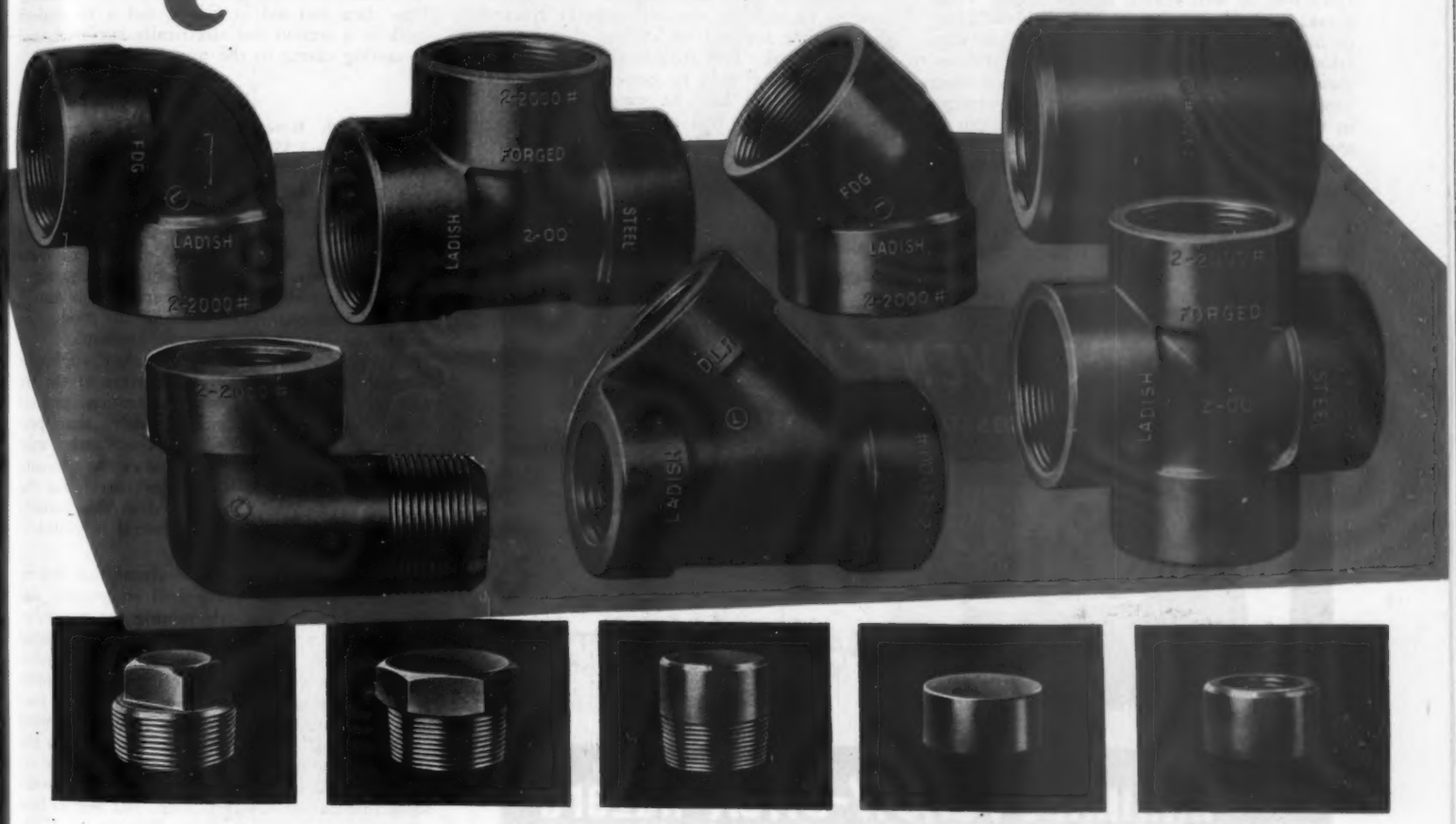

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ling factor in rate of penetration and except in rare instances determines the pattern of the curve. For this reason drilling-time logs may be used for most purposes served by the potential curves of electrical logs. Examples are shown of remarkable correlations between the two types of logs.

Besides this correlation it is possible to get excellent correlation between drilling-time logs of different wells. Drilling-time breaks in shale sections have been noted which are consistent from well to well within limited areas. These breaks probably represent changes in lithology or mineralogy which are not reflected on electrical logs and might even escape notice in cores; these breaks are not only correlative on drilling time logs, but are found to coincide with changes in the radioactivity of the shales. They can be correlated with gamma-ray logs in sections where correlation is not possible with electrical logs, which has been found helpful.

Use of drilling-time correlation makes it possible in advance of electrical logging to decide whether a given well is thinning or thickening. Missing sections and information on the position of fault planes have been determined in a number of wells and the information used in changing the tentative coring program. Correlation with drilling-time logs has been used to check the course of directionally-drilled holes without having to make electrical surveys or to do unnecessary sidetracking. Advance correlation with drilling greatly aids in selection of coring points. The author's experience is that coring is kept at a minimum, with a higher percentage of cored sand section. Their practice now is to pick up the coring point from the drilling-time log and to log the electrical survey afterward. This reduces the effect of mud infiltration and aids in correct interpretation of the electrical log. In many cored sections drilling-time data will yield more complete information than an electrical log only, especially in the matter of calculation of the net sand thickness.

Again, it is obviously more accurate to plot the lithology of a sand section by drilling-time than by plotting a core log, omitting the lithology of the core that was lost. In sections where there is rapid changes in lithology from porous sandstones to dense calcareous slightly sandy limestones and where there is a large loss of core the interpretation of the complete geologic column would be impossible without the aid of drilling-time data. Even border-line cases may be correctly interpreted from this data, eliminating time and expense of taking sidewall cores except in sands.

The authors further go on to show how drilling-time data can aid in fishing out a twisted-off drill in a section not electrically surveyed, and in setting casing in the presence of cavities.

Coring with Reverse Circulation Rig. — Lewis Finch, Jr. and Whitney M. Elias, before A. P. I. Division of Production, MID-CONTINENT DISTRICT, Tulsa, May, 1944.

In the dolomitic limestone section of West Texas, where it is extremely difficult to make accurate determinations of formation characteristics by methods other than coring, it is almost essential that continuous cores of the production section be cut and recovered. Incomplete core recovery is often of no value. Any applicable method which will result in recovery of the entire section cut is worth consideration, even if it were considerably more expensive than procedures commonly employed. Use of the wire line core barrel partially overcomes the necessity of pulling drill pipe to recover cores, but the amount of core being recovered in this manner is not known until after the barrel is pulled.

It is known that the reverse circulation process has been used with rotary drill equipment, and the authors set about determining the possibility of adapting a similar principle in conventional rotary coring. After considerable experimentation they succeeded in devising an arrangement whereby sections of cores averaging about four inches in length could be dislodged after being cut by a 4¾" cutter head and brought to the surface without jamming on the way. The results obtained in six West Texas dolomite wells show that out of 724 feet cored, 702 feet of core were recovered, a recovery efficiency of 97%. The average coring time was 58 minutes per foot, and each core head lasted out approximately twenty-five feet of section, and the average cost of a job was $2,336.98; this is equivalent to $19.37 per foot of core cut, or $19.97 per foot of core recovered. In all six wells the circulating fluid was oil. In the six hard dolomitic sections cored the fragmentation of cores was not noticeable.

In comparing this method with conventional rotary coring the authors make the following observation:

Conventional rotary coring requires pulling the drill pipe to recover the core. As a general rule the per cent of core recovered leaves much to be desired. It is estimated that this method results in approximately 55% recovery in the area analyzed and consequently the cost per foot recovered relative to the cost per foot cored increases significantly from $19.00 to about $33.00. Coring with reverse circulation has resulted in recoveries closely approximating 100% and consequently the cost per foot penetrated and the cost per foot ercovered are nearly equal averaging $19.00 to $20.00 per foot. Actual comparison between these two methods shows that, in the area analyzed, conventional rotary

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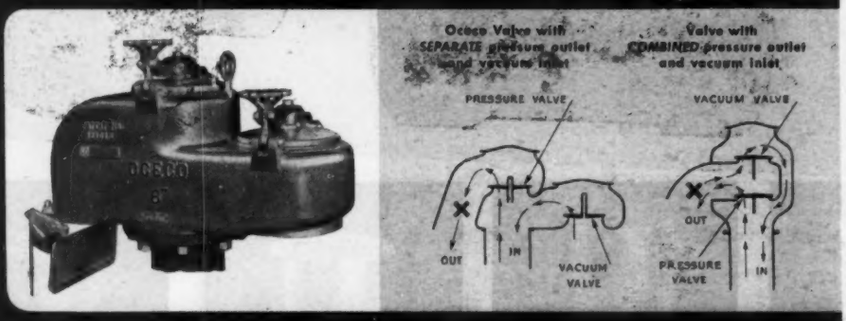

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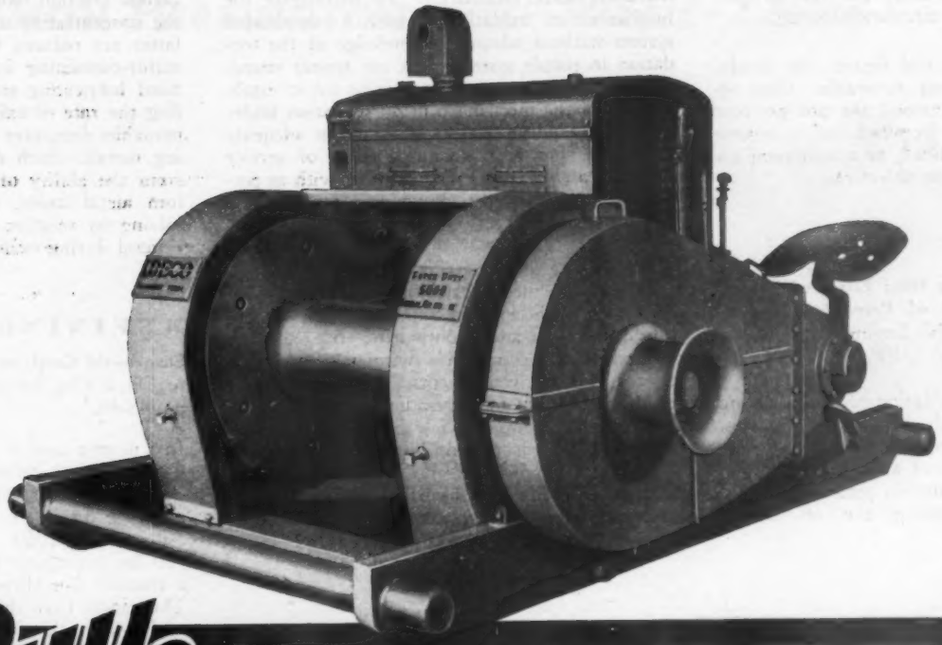

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coring costs 1.66 times more per foot of core recovered than reverse circulation coring.

Based upon these facts and figures, the results of the experiment appear favorable. Core recovery was definitely increased, the cost per foot of core recovered was decreased and a reverse circulation rig was modified, at a minimum expense, to accomplish these objectives.

CHEMISTRY

Oxidation of Lubricating Oils; Effect of Natural Sulfur Compounds and of Peroxides.—G. H. Denison, Jr. in Industrial Engineering Chemistry, Vol. 36 (1944) No. 5, PP. 477-482.

In actual service the oxidation of a lubricating oil takes place in highly complicated systems. For example, in an internal combustion engine, catalysis by metal surfaces and metal soaps as well as complex variations in temperature and oil-air agitation throughout the oil stream markedly affect stability. To investigate the mechanism of oxidation in such a complicated system without adequate knowledge of the oxidation in simple systems does not appear sound. The air of the present paper is to aid in establishing a basic mechanism of oil oxidation under as simple conditions as feasible; when adequate knowledge has been obtained, effect of service variables and catalysts may be dealt with as perturbations on the reactions taking place in simple systems.

By extensive experimental work the hydrocarbon fraction of refined lubricating oils is shown to consist of naphthenes in admixture with homolors of benzene and naphthalene. By removing natural sulfur compounds without appreciably affecting other constituents, this hydrocarbon fraction is shown to possess negligible resistance to oxidation. Thus, the few per cent of natural sulfur compounds present in a finished lubricating oil appear to determine the oxidation characteristics. This control of stability is interpreted as resulting from the fact that the hydrocarbon fraction oxidizes at a rate controlled by the concentration of organic peroxides, and the latter are reduced by reaction with the natural sulfur-containing inhibitors residual in the refined lubricating stock. In addition to controlling the rate of oxidation of an oil, the organic peroxides determine the rate of corrosion of bearing metals. Such corrosion is shown to result from the ability of peroxides to convert metal into metal oxide, the latter subsequently dissolving by reaction with acidic constituents developed during oxidation.

REFINING

Suspensoid Catalytic Cracking.—Arch G. Foster in Oil & Gas Journal, Vol. 42 (1944, No. 52, pp. 43-46.

In a process now in commercial operations at the Sorina (Ont.) refinery of Imperial Oil, Ltd., a slurry of cracking-oil charge and a finely divided clay-type catalyst is pumped through a cracking coil at 1040°-1060° F. under a pressure of 400-500 lbs. per square inch and discharged through a transfer line directly into the flash chamber. The vapors from the flash chamber are fractionated within the desired distillation range; the fractionator bottoms are usable as furnace oil or as a relatively low-octane diesel oil. The unvolatilized tarcatalyst mixture left in the flash chamber is hot-filtered on pre-coat Oliver filters; the tar filtrate from these filters is salable fuel oil or is used in the manufacture of asphalt. The spent catalyst from the filters is at present dumped as waste.

The working capacity of this catalytic cracking installation is 17,000-18,000 bbs/day of a charge which is made up of a mixture 75 parts of light intermediate and heavy gas oils, to which is added 25 parts of a heavy naphtha which functions as a diluent. After passing the catalytic cracking tubes the charge is quenched with 35-40 parts of gas oil.

The yield of 400° end point gasoline is 523-586 percent, about the same as is obtained by thermal reforming and cracking of the same material (Mid-Continent and Illinois crude) but the ASTM clear octane number is 7.-8-8.9 points higher, and with 3 cc of TEL may be brought up to 93 octane number. The catalyst used is epent Filtrol from the refinery's lubricating oil plant, and is employed at the rate of 2 lb. per bbl. of charge. Erosive action of the catalyst as it passes through the system is regarded as unimportant.

While the process is functioning satisfactorily at the moment, there remain a number of points to be cleared up before its prospects can be accurately gaged. For lack of time and materials the optimum ratio of catalyst to charge has not been determined. Also, the economics of diluting the charge with heavy straightrun naphtha have not been fully studied. The problem of regenerating the spent catalyst has not been approached. This problem is of little consequence to a refinery that uses Filtrol in its lubricating oil department, but is likely that refineries that lack a supply of used Filtrol from such a source will find the suspensoid catalytic cracking process uneconomic.

(Note: - It may be recalled that this process is basically similar to the Fischer process for the manufacture of petroleum from coal, in which finely powdered coal is slurried with heavy oil and a catalyst and pumped through heating coils. - Ed:)

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Mercapsol Process for Gasoline Treating.—B. L. MacKusick and H. A. Alves, in Oil and Gas Journal, Vol. 42 (1944), no 49, pp. 126-127, 252, 255.

The "Mercapsol" process is intended to circumvent the deficiencies of the doctor process, which is not selective enough, even when used in large proportions, to remove enough mercaptans to give a satisfactory product.

The mercapsol process is based on the use of water solution of caustic soda to which are added various substances that tend to promote the solubility of the mercaptan compounds in the caustic solution. Several such solution promoters have been found useful, and include certain types of naphthenic acids and oresols; a wartime substitute of greater availability and substantially equal effectiveness consists of high-boiling tar acids which are a by-product from the coking of coal, according to United States patents Nos. 2297621, 2316753, 2316966, 2341917, and 2341918.

In operation the process consists of prewashing the raw gasoline with dilute caustic to remove hydrogen sulfide; this prevents the accumulation of sodium sulfide in the treating solution. After a water washing the gasoline is introduced at the bottom of a packed treating tower through which it rises counter-currently to the decending mercapsol solution. After settling and removal of the last traces of the treating agent the gasoline is water washed and dried.

The spent treating solution is stripped of traces of gasoline, and the mercaptans it has taken up are expelled by steam, whereupon it is suitable for reuse. The process is being successfully exploited in a unit treating 5000 bbl. a day. Data are presented to show that mercaptans are almost completely removed in one treating operation; the process is economical and requires a minimum of attention.

Development of the Hydrogen Floride Alkylation Process.—C. G. Gerhold, J. O. Iverson, H. G. Nebeck and R. J. Newman, in TRANSACTIONS AMERICAN INSTITUTE CHEMICAL ENGINEERS, Vol. 39 (1943) No. 6, 19 pages.

This article tells the story of some of the problems that arose in the course of application of HF to the alkylation of isoparaffin and olefin hydro-carbons. The fact that HF could be used to catalyze this alkylation process was discovered by Ginn and Grosse. Commercialization of the process was delayed largely because of certain disagreabele properties of HF and experience in producing and handling it in large quantities had to be acquired.

The two major advantages of HF alkylation over the older sulfuric acid process result from the higher process temperature that can be used, and the greater ease of regenerating the catalyst. For one thing, the higher temperature permits the use of water to remove the heat of reaction, and thus does away with the need for refrigerating equipment.

Three major problems that had to be solved in the pilot plant stage of development were recovery of HF dissolved in the alkylation products, deflourination of the alkylation products, and regeneration of the catalyst. These problems have been solved, but the means used are still under secrecy.

The principal reactions occurring in the reaction zone are apparently as follows:

(1) Direct interaction of an olefin and an isoparaffin, either of which may be charged as such or may be the result of previous reactions.

(2) Dealkylation of paraffins of high molecular weight.

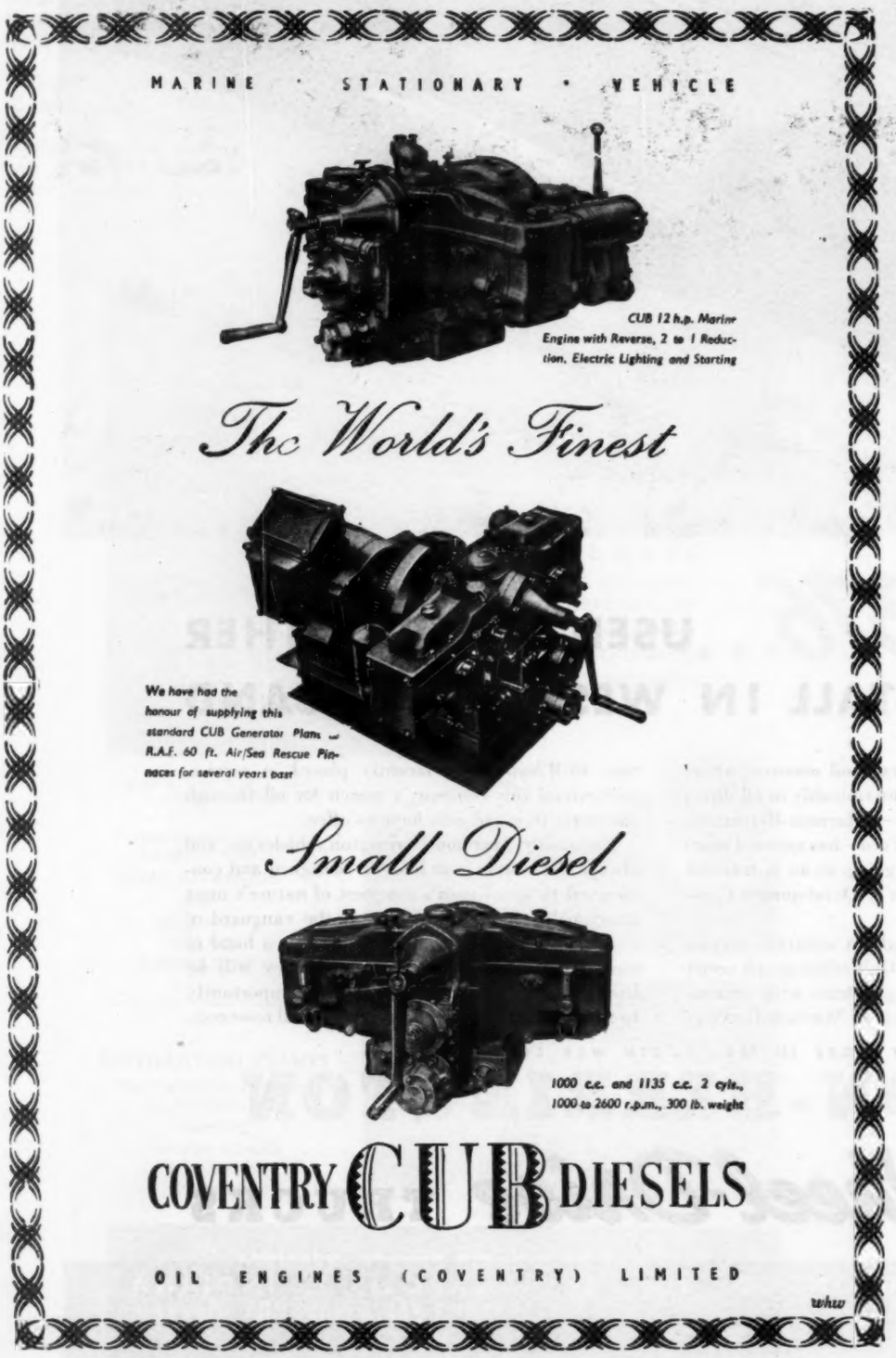
(3) Polymerization of olefins to form olefins of higher molecular weight.

(4) Depolymerization reactions.

(5) Hydrogen transfer reactions between olefins to form saturated hdyro-carbons and tars of low hydrogen content.

(6) Hydrogen transfer reactions between paraffins and olefins to form a paraffin corresponding to the olefin and an olefin corresponding to the paraffin.

(7) Probably by the above reactions, net isomerization, particularly of the alkylate product, may occur.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Correct piston temperatures are assured in the Hendy engine by means of the heavy ribbing on the underside of the pistons and by direction of a continuous stream of cool oil against the ribs. By controlling the temperature of the pistons—and their rings—a superior oil film is maintained on the cylinder walls. This has many advantages: Reduced ring wear...reduced cylinder wear...low oil consumption...freedom from stuck rings...higher operating efficiency...lowered maintenance costs. All of these factors save money for Hendy owners—and are typical of the advanced design features of these engines.

350 TO 675 HP—4 CYCLE

Whatever your requirements may be, within this power range, you will find that Hendy Diesels warrant your closest inspection—they will give you long and dependable service.

For stationary power service or combined with generators as electric power units Hendy Diesels offer a reliable, economic source of power.

A NEW CATALOG which shows many other features of the Hendy Diesel is now available. Please state your power needs and operating conditions if requesting quotations.

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A variety of products may be made by changing the balance of these reactions. The most desirable products are those of the direct combination of the olefin and the isoparaffin feeds, and conditions should be so chosen as to favor such a reaction within the limits of commercial practicability. The means of adjusting the balance between reactions lies in the control of the concentrations of the various reactants and reaction products.

The undersirable reactions between olefins may be minimized by maintaining a low concentration of organic fluorides in the catalyst phase; this condition may be brought about by the use of a large catalyst pool relative to the charge rate. Therefore, units should be designed and operated to maintain a relatively large volume of catalyst in the reaction zone.

The desired reaction of primary alklation is favored by a high concentration of isobutane and a low concentration of alkylate in the catalyst phase.

Much of the work of development was carried out by UOP in connection with Phillipps Petroleum Company, who were attracted mainly by the two facts that the HF process does not produce the by-products met with in the sulfuric acid process, and that HF does not take part in oxidation-reduction reactions.

New Processes and the Post-War Light Ends Situation—D. P. Barnard and J. H. Forrester, before NATIONAL GASOLINE ASSOCIATION OF AMERICA, Dallas Meeting, April, 1944.

After a detailed study of the operation of wartime catalytic cracking operations, and the probable qualitative and quantitative demand for motor fuel in the postwar period the authors reach a conclusion that the present extensive facilities for catalytic cracking will produce greater amounts of butanes than heretofore, and that there will be increased uses for these butanes. In fact, it seems that the new consumption of butanes will exceed the new production, but will not be enough to absorb all recoverable butanes produced by the whole refining industry. This will leave some butane, estimated at 20,000 bbl./day, for which no use can be found other than as fuel. This sacrifice of a valuable source of potential values is regarded as unfortunate if we are really facing a shortage of crude oil and will need to save all possible values contained in the decreasing supply of this prime raw material. The impending shortage of petroleum, if it materializes, will certainly cause a rising price for crude oil, which in turn will provide an economic incentive to use butane in some other way than by consuming it in the refinery furnaces.

The authors believe that the expected excess of butanes can find good use to increase front end volatility of motor gasoline, raising the Reid vapor pressure, now standardized at 10 lb. to 12 lb. This would be about sufficient to absorb the excess. They admit that two possible objections will be urged. The first will be the bogey of vapor-lock; this, they say, is practically absent from modern passenger cars, due to improved valve designs. The other objection will arise from the need of providing gasoline for commercial vehicles, the engines of which are not so finely built.

BOOK

Latitude and Departure Tables; their Application and Use for Computing the Course of a Bore Hole.—Compiled and published (1944) by Sperry-Sun Well Surveying Co. Philadelphia, Pa. 51 pages—$5.00.

This collection of tables was compiled (evidently with considerable trouble and expense) by the Sperry-Sun Well Surveying Company for use within its own organization, and is now made available to the oil industry. The tables are arranged to provide a quick and accurate means for computing the course of a bore hole from records obtained with multi-shot or single-shot surveying instruments.

Calculations of vertical depth, course deviation, latitude, departure and the use of the tables in such computations, are explained by simple examples. Directions are given for the tabulation of survey records and the plotting of survey maps. The tables, which include the whole range of latitude and departure values of inclination and directional angles, cover 40 large pages. An appendix gives directions for correction of magnetic compass records. The book is a manual which will prove useful to well surveyors.

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1 STRESSED SKIN CONSTRUCTION —is light and easy to handle, is strong and tight against vermin, drafts, and moisture.

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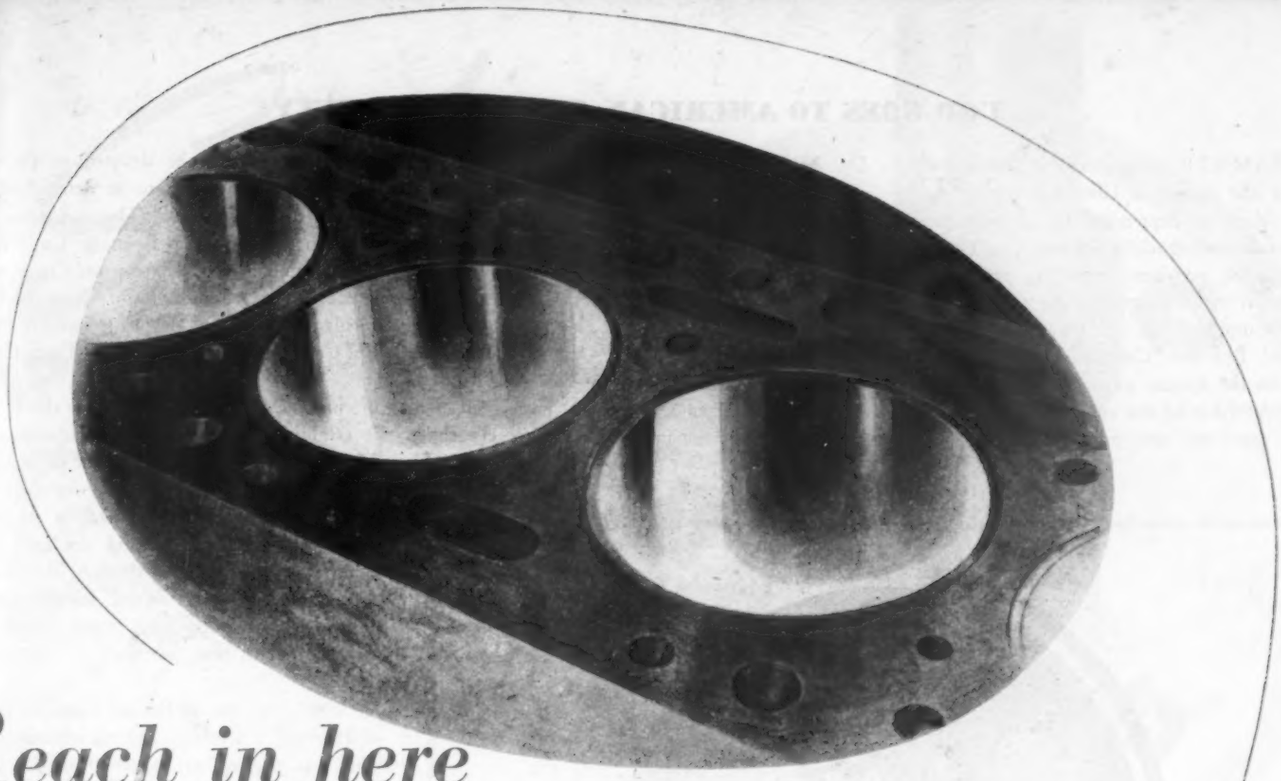

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UOP GOES TO AMERICAN CHEMICAL SOCIETY

A DRAMATIC announcement featured the dinner of the American Chemical Society held in New York on September 13, in connection with the fall meeting of the Society. Dr. Thomas Midgeley, Jr., president, took the occasion to make known to the assembled guests and members of the organization that the owners of Universal Oil Products Company had offered to transfer to the Society as an outright gift the full proprietorship of the company including all its stock, securities and processes.

Dr. Midgeley stated that the estimated value of the gift was from $10,000,000 to $15,000,000 and its yearly income approximately $1,000,000. He added that the offer had been accepted by the board of directors who had appointed a special committee to work out final details of the transaction.

In making this unusual and public spirited offer the six large oil companies who have been the owners of the company stipulated merely that the income should be devoted to the conduct of research along lines to be determined by the directors of the society. The companies making the gift are Atlantic Refining Co., Gulf Oil Corporation, Phillips Petroleum Company, Shell Oil Company, Standard Oil Company of California, Standard Oil Company Indiana, Standard Oil Company (N. J.) and The Texas Company.

Giving point to the purpose of the companies in establishing this research foundation Bernard M. Baruch, in his address at the dinner, praised American scientists and industry for their "miraculous achievement" in completion of the synthetic rubber program, and declared he had become profoundly impressed with "the need of a greater use of trained scientific practical minds to help solve the many economic and social problems that face us".

He cited Dr. James Bryant Conant, president of Harvard University and an eminent chemist, who was present as recipient of the society's highest award, the Priestley Medal. He praised Dr. Conant, who with Dr. Karl T. Compton, president of Massachusetts Institute of Technology, helped to plan the rubber program, for a major part in its success.

"I hope that in the future, even in the fields of economic, political and social matters, national and international, more of these trained scientific minds, these experienced researchers after facts, truths and realities, will be asked to help solve the problems that arise," Mr. Baruch said.

For many years Universal Oil Products has been an important factor in the oil industry, beginning with its introduction of the Dubbs process of cracking which has been installed in every part of the oil world and has been instrumental in doubling the yield of gasoline from a barrel of crude. With the growth of its business the company expanded its activities in the field of research. From its laboratories have come many processes yielding new and improved petroleum products. The latest of these to be publicly announced is a method of producing triptane which brings most powerful product within range of commercial production. It is stated that no change will be made in the operation of the company.

While no statement has been made by the oil companies regarding their action it is understood that their feeling was that since the companies have developed large research departments of their own there no longer is the same need as formerly for a jointly owned research organization. Moreover, it is pointed out that under independent ownership and direction a company such as Universal can be of greater service to the industry as a whole, particularly in improving the facilities of the smaller refining units.

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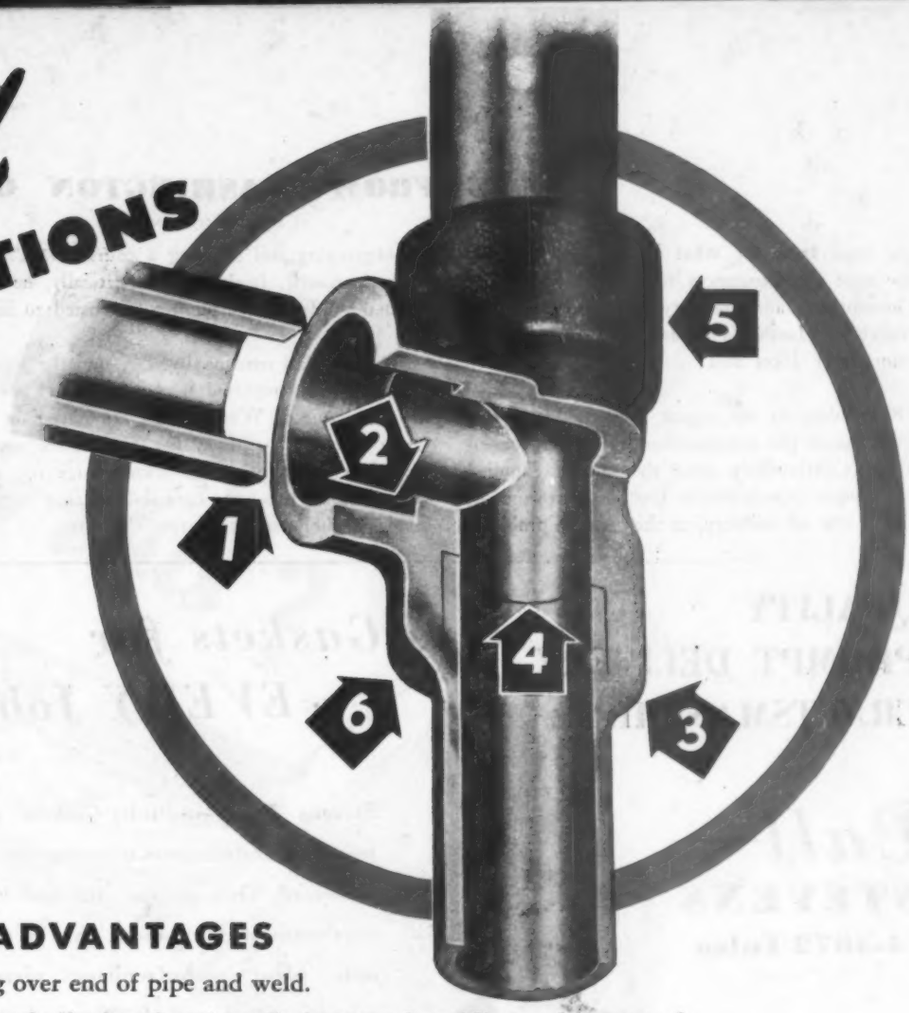

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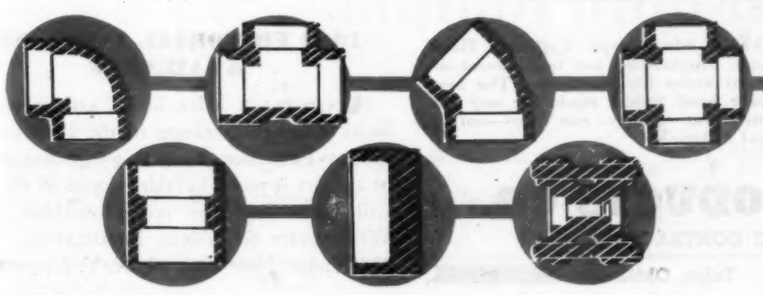

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ECHOES FROM WASHINGTON OIL FRONT

(Continued from page 62)

the legal basis for what has become probably the most noted instances of cooperation between Government and industry. In expressing his regret at Marshall's departure, Petroleum Administrator Ickes said:

"Responding to my urgent request, Mr. Marshall joined the organization at the very beginning. Continuously since then he has applied his unique experience in law, in Government, and in the oil industry, to the creative problems of organizing and charting a course for PAW Conscientiously, fairly, and impartically, he has discharged the responsibilities entrusted to him.

"Mr. Marshall remained well beyond the period originally contemplated in June of 1941 when he first came to Washington. He stayed on at great personal sacrifice for over three years and I wish personally to acknowledge my appreciation of the large contribution that he has made in public service during the war.

"The assignment with PAW represents the second time that Mr. Marshall, at my personal request, has entered the public service in time of crisis. He was a member of the Petroleum Administrative Board during the NRA period and helped win the battles of 'hot oil'—a step forward in the conservation of our vital petroleum supplies for which, in the present emergency, we may indeed be grateful".

Marshall returns to California to rejoin the law firm of Pillsbury, Madison, and Sutro of San Francisco. His successor as chief counsel of PAW is Robert E. Hardwicke, prominent Texas oil lawyer.

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Government Sells Elk Hills Oil

ACTING Navy Secretary Ralph A. Bard's sale of some 2,500,000 barrels of crude, estimated production for Navy's account from Elk Hills reserve for the six months ending December 31, 1944, has obtained the approval of the President. Contracts were signed with the Union Oil Company of California, Shell Oil Company, General Petroleum Corporation of California and Mohawk Petroleum Corporation.

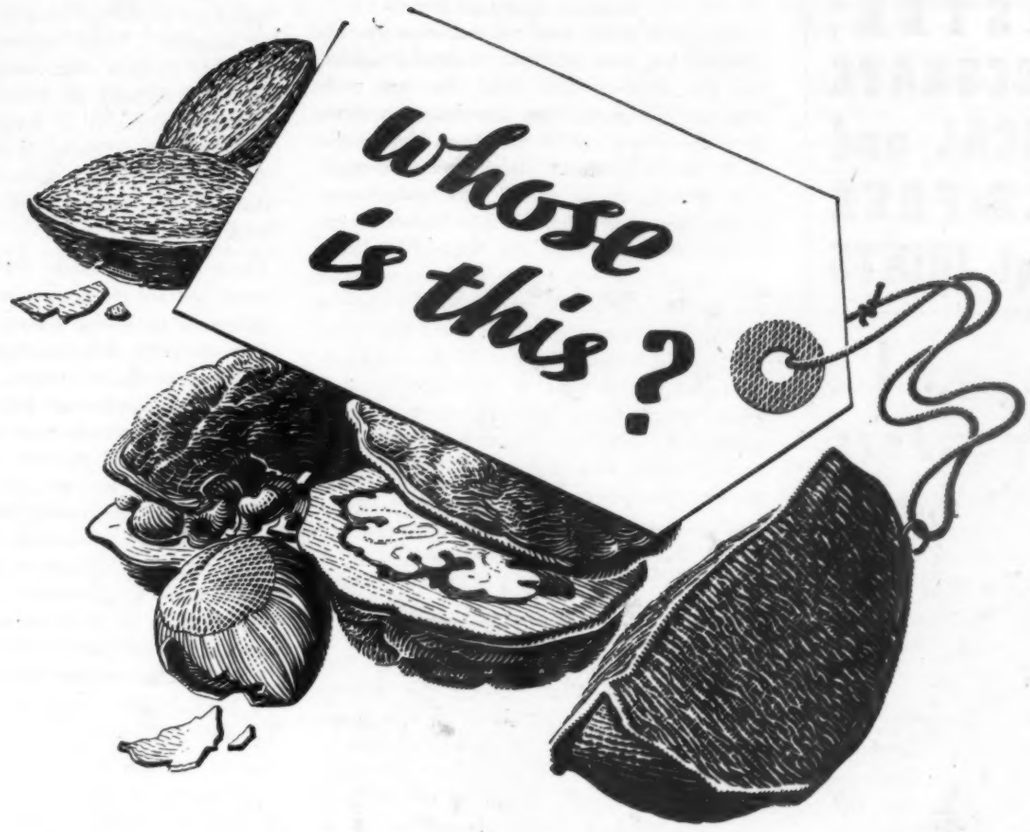
This crude is the first to be produced from the reserve under the unit plan contract between the Navy and California Standard, signed by Navy Secretary Forrestal June 19. The four purchasers under the contracts of sale possess refining capacity immediately available to supply needed military and naval products. It is expected that a second offering of crude from Elk Hills for the six months beginning January 1, 1945, will be made later this year.

Army Goes to Premium Gas

THE Army has shied away from "housebrand" gasoline for the use in the vehicles in this country now that the quality is lowered to conserve tetraethyl lead for fighting forces. Orders have gone out from the Quartermaster General that a switch is to be made to "premium" gasoline. For some time the Army vehicles in this country have been operating on "housebrand" as virtually all 80-octane "all purpose" gasoline goes directly to overseas theatres of operations, where vehicles must operate at maximum efficiency.

1943 EDITORIAL INDEX NOW AVAILABLE

A COMPLETE index of all articles and editorial material appearing in the 1943 issues of WORLD PETROLEUM, together with a cross index of authors is now available. Copies of this index will be mailed upon request without charge. Write direct to WORLD PETROLEUM, 2 West 45th Street, New York 19, N. Y. for your copy.



Like most people these days, we find ourselves spending a lot of time on problems which affect the war effort in some way or other. But we don't want to make a fuss about that. It's true that our method of moulding brake linings on cylindrical drums has been of great service to the aircraft industry, and by finding a way of cementing friction material to metal without using rivets or similar means of fastening we made ourselves very useful to certain people who make superchargers for aircraft engines. In the belting field, as well, we've kept a jump ahead of developments, particularly with woven endless belts, which are a cure for many industrial headaches. The point is that when it comes to belting of all kinds, asbestos products, friction materials, brake and clutch linings, packings or jointings we're not just manufacturers. If you use any of these things you'll find that we've got the answer to most of the problems which crop up from time to time and if we haven't, well . . . we like hard nuts to crack.

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Airetool Tube Expanders are carefully designed, precision built and thoroughly tested. Made in a variety of styles and sizes for tubes from ½" to 12" I.D.; universal or right angle drives; ironing out attachment when desired.

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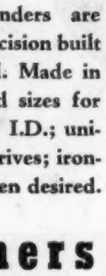

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THE SYNTHETIC PROCESS

(*Continued from page 56*)

with economics and with political necessity. The problem has been redefined. Instead of obtaining the reactants from coal, they are to be obtained from natural gas. Instead of producing at a cost which can be subsidized, the product is to be competitive with natural petroleum. The primary theme is still "the reduction of carbon monoxide", but the most important secondary theme is now the removal of large amounts of heat from the reaction zone to reduce the cost of the plants which, on the basis of German technology, would be about four times as expensive as a conventional petroleum refinery. Work on various facets of the research is now going on in many industrial and academic laboratories, and our Government will spend several million dollars on the research during the next few years.

The driving force behind all this work is, of course, that our reserves of petroleum are not inexhaustible and for reasons of national security we should not become dependent wholly upon imports. Oil for the duration of the next war must be in the United States—not somewhere else. Abundant oil somewhere else may be available only to our enemy. Postwar importation of oil, even if accelerated to the utmost by Government action, will neither save the major part of our domestic oil reserve for the next war, nor can it be depended upon to provide oil for the conduct of the next war except for the relatively small part of our imports which can be stored. The major load will have to be on petroleum products from our supplemental reserves, and this load cannot be carried by the commercialization of processes in time of emergency. The commercialization must be done in time of peace leaving only expansion of going processes as a war-time activity.

It is estimated that our known natural gas reserves are not much more than seventy percent by weight of our petroleum reserves, and it is recognized that only a small proportion of our gas can be diverted to petroleum synthesis. The second phase of the research should, therefore, be completed in about ten years, and a third phase should then be well under way. With the background of chemical and engineering experience, it should be possible to revert to the use of the coal theme and still maintain low costs. The Russians have already made great preliminary contributions to the third phase by the processing of coal deposits underground with the elimination of primitive mining technique.

The economic factor is associated with our system of "free enterprise". It has been responsible for the greatest industrial research not because it has made research "free", but because it has provided such rigid constraint. The limitation of national welfare is not as definite, hence not as useful for research, as the limitation of profitability. There are much wider differences of viewpoint in matters of politics than in matters of business. Until national welfare emerges from the mists of controversy, it can form only a flabby framework for research. For this reason, perhaps, the quality of industrial research done by government agencies, in spite of personnel of distinguished ability, cannot be compared with that done by private agencies concerned with profit.

There can be no doubt that in the future national welfare must come before anything else. Otherwise the nation cannot survive. It would seem, therefore, that two things should be done: First, problems of national welfare must be clarified by disinterested definition. Second, national welfare must be made a part of the framework of industrial research—not as a substitute for profitability but as a partner. Inasmuch as all limitations of research must be compatible, it will become increasingly necessary for our Government to contrive to make it profitable to be patriotic. Obviously, this must be the first concern of a Government of a people devoted to the "profit system". Otherwise the "profit system" cannot survive.

Our dilemma is strikingly illustrated by the possible necessity for the spending of several hundred million dollars for the development in this country of substitute sources of petroleum products before this development can be justified on economic grounds. There are two ways to define the problem. If such research is to be carried out without reference to economics, it must obviously all be done by Government. But if Government can take suitable steps to make the development profitable, it will all be carried out by private interests. The second course is much to be preferred because it offers a research framework with the maximum of structural limitations—but the decision must be made by Government. There are many ways in which national welfare can be made to join with profitability as parts of the mold into which the industrial research of the future can be poured. The apparent loss of freedom will only inspire more progress and greater research than any we have seen in the past.

The Synthine process is being evolved slowly through painstaking labor. Works of art are not born in their final perfected shape. The notebooks and work sheets of the composers of music and the painters of pictures have shown the false starts, the extraneous material which it has been necessary to discard, the unsuccessful experiments, and the variety of arrangements which have been compared. The final work has been shorn of everything inappropriate. The dross is not a part of the perfected product but is an inevitable part of its history. Every research has its history of incongruities, of false clues, of incorrect deductions, of progress through eliminated assumptions. The Synthine process is no exception.

PIPE LINE OUTLET FOR WILLAMAR FIELD

OPENING of Pan American Pipe Line Company's new line from the Willamar field in Willacy County, Texas, to Port Isabel provides a permanent outlet for the crude produced in this field and eliminates the necessity of moving its oil by tank car. The line is approximately 34 miles in length and is constructed of 8⅝" seamless steel pipe, solid welded and protected from corrosion by asphalt bound felt wrapping. Initial capacity is 12,000 bbl. daily which can be increased through installation of additional pumping units.

The line is served by a gathering system and four field gathering stations covering the entire productive area, which is now approximately three miles wide and five miles long, in which there are over 50 producing wells, all flowing their allowable.

Development of Willamar Field began in 1940 when the Pan American Production Company acquired an individual 37½% interest and operating control in the Shell Oil Company and Standard Oil Company of Texas jointly owned 6200 acre lease block on the Willamar prospect in southeastern Willacy County which, added to 2100 acres of full interest leases previously acquired, gave Pan American some 4500 acres on the prospect.

The discovery well, designated as Willamar Community #1, was completed by Pan American on November 18, 1940, through perforations from 7620-78' opposite opposite sands in the top of the Frio formation, flowing at the rate of 288 barrels of 30 gravity oil per day through a 3/16" choke. A number of additional wells were drilled up to April 1942 when the shortage of materials became so acute that drilling operations were suspended.

An important extension was afforded in the summer of 1943 when Baldridge & King completed their J. C. Cavazos Well #1 almost two miles south of the nearest production. The successful completion of this wildcat touched off a spirited drilling campaign in the newly discovered area while normal development was renewed in the older part of the field. During much of this time there were as many as twelve rigs running in the field, including a new operation by Humble Oil & Refining Company on its King Ranch lease over a mile north of the nearest production. This well, Humble's #1 Sauz Ranch, was completed in May, 1944, lengthening the producing area to five miles in a north-south direction, as compared with an east-west width of about three miles across Share 13.

Three of the earlier wells at Willamar were drilled to 9,000 feet, about 1,000 feet below the regular field producing section, recording a few shows below the regular producing horizon which were non-commercial. Consequently, nothing is known of the producing possibilities in the deep Frio sands. Recently the Sun Oil Company drilled its Santa Rosa Well #1, a wildcat, about seven miles west of Willamar to a depth of 11,520 feet, at which point the well had penetrated 4600 feet of Frio formation and was still in sandy section. Whether these sands will be present at Willamar is, of course, impossible to say in the absence of a deep test. Pan American is now drilling Crane Well #1 on the partnership acreage which is projected to 12,000 feet and should throw much light on the question of deep producing prospects on the structure.

Subsurface control from wells drilled to date, combined with seismograph data, make it appear probable that the Willamar producing area may ultimately cover something like 10,000 acres, which definitely establishes it as one of the major discoveries in the Gulf Coastal area during the past five years.

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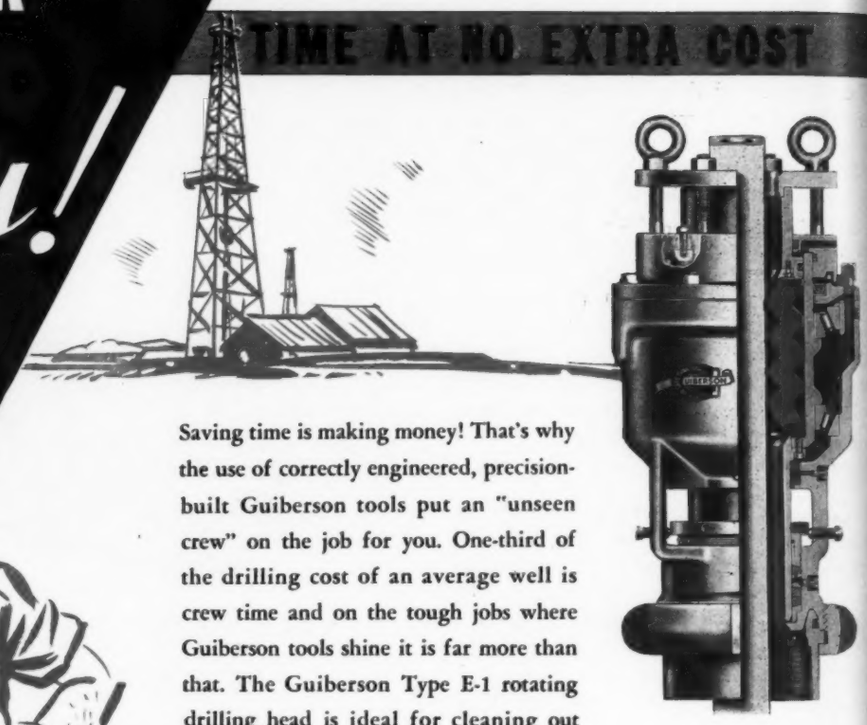

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